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FACTORS AFFECTING THE EXPORT OF HIGH-SULFUR COAL FROM THE EASTERN INTERIOR BASIN—CONFERENCE

PREPARED FOR THE

SUBCOMMITTEE ON ENERGY, NUCLEAR PROLIFERATION, AND GOVERNMENT PROCESSES

OF THE

COMMITTEE ON GOVERNMENTAL AFFAIRS

UNITED STATES SENATE

BY THE

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LETTER OF TRANSMITTAL

U.S. SENATE,
COMMITTEE ON GOVERNMENTAL AFFAIRS,
SUBCOMMITTEE ON ENERGY, NUCLEAR PROLIFERATION,
AND GOVERNMENT PROCESSES,
Washington, D.C., Dec. 22, 1982.

Hon. WILLIAM V. ROTH, Jr.,
Chairman, Committee on Governmental Affairs.

DEAR MR. CHAIRMAN: As Chairman of the Subcommittee on Energy, Nuclear Proliferation, and Government Processes, I am submitting this report prepared by the Coal Extraction and Utilization Research Center of the Southern Illinois University at Carbondale, located in Carbondale, Illinois. The report follows a series of hearings I held in June 1981 in Carbondale and Springfield, dealing with factors affecting the export of high-sulfur coal from the Eastern interior basin.

Sincerely,

CHARLES H. PERCY,
Chairman.

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PANEL ONE-A

PRIVATE AND PUBLIC ACTIONS FOR INCREASING HIGH SULFUR COAL EXPORTS

SENATOR PERCY: Would those who testified this morning come forward now to be seated at the table. That would include the Minister K. S. Chang and Mr. David Lan Cheng, Republic of China; Mr. Kinoshita of the Electric Power Company of Japan; Mr. Willem Daniels, French Importers; Mr. Jean Faucounau of the French Coal Producers; Dr. German Dominguez of the Spanish Embassy; and Mr. Lee of Korea; they will be joined at this time by Mr. Williams of Old Ben Coal and Mr. Wayne Ewing of Peabody Coal.

Now, the format for the first panel this afternoon is a very simple one. We're going to talk about Illinois coal exports. We had a chance this morning to hear, in a very formal way, the presentations by both potential importers abroad and producers in this country. I had the chance on a unilateral basis to pose questions of the witnesses this morning; I feel certain that they have questions that were raised as they were listening to their colleagues and the others. And now, at this time, you have the chance to initiate your own questions and it's really a dialogue--an interplay between the panelists themselves. I'll just pose one or two questions to get us started and then turn it right back over to you so you can ask any questions that you would like.

THE IMPORTANCE OF INTERNATIONAL COOPERATION

The first question that I'd like to put to you is this: would you comment on what you might have learned that you think is important, something that as you checked it off in your mind you might have known before, but that was put in a different perspective? And then, second, what kind of service do you think I can offer as a Senior Senator from Illinois in the dual role that I have, not only to represent my State of Illinois, and to improve and strengthen the economy of the country, but also in the role that I have as the Chairman of the Foreign Relations Committee?

Certainly, in regard to each of the panelists, as I said this morning, we must have close working relationships with you; it's a two-way street. I hope I can contribute something because when I look at the indebtedness that I have to the land of my grandmother, who was born in Stuttgart, Germany, I see we not only have a marvelous ally and a very close friend in Chancellor Schmidt, but we also have someone with whom I had the privilege of having dinner the night before I left for the Soviet Union. He totally changed the character of my trip by simply saying, "It is terribly important that Americans have a chance to meet other members of the political world other than President Brezhnev and Foreign Minister Gromyko as has been the occasion a number of times in the past. It is important to meet others in the international community." And so I did meet with some of them, and the first call I made after calling President-elect Reagan was to Chancellor Schmidt and Foreign Minister Gromyko to report to them how fruitful their suggestions had been to me.

My point is that the chance for enriching each other's lives and contributing a great deal exists right here, and so please comment on what you did learn this morning that was important to you

and what you think is important to this conference. Second, what I can do to be of greater assistance to you, either as a potential importer of Illinois coal or as a producer of coal, to help break down some of the barriers. And after that, I'll leave it up to you to carry on a general conversation and when I have to leave to go to another conference that is going simultaneously here in the building, Congressman Paul Simon will take my place.

MR. DANIELS: Just three remarks. Referring to a statement made by Mr. Bagge this morning, I think it is going to be very necessary for your country to have a coal mining group in the Administration to follow problems in the future. I want to express myself openly, but in a sense it might be a somewhat touchy problem for you, so I am very glad that Mr. Bagge made that point.

Second, concerning the remarks about ports, Illinois is going to be in an excellent position with the future capacity of New Orleans. We ourselves are already enjoying the good facilities provided right now by increasing exports, and I must say that we are very satisfied with the performance of the existing terminals and the midstream ports.

On the third point, I'll be very short because I'm not too familiar with it; it concerns techniques which are being used in Illinois and which should be brought over in some way or the other to France. As regards channels and contacts, we would have to discuss that later on, but I think much has to be said to France.

SENATOR PERCY: Thank you.

MR. FAUCOUNAU: I would just add some remarks to what has already been stated by Representative Daniels.

DESULFURIZATION PROBLEM

The first one concerns the action that you can have as Senator. I believe that one of the most important things you can do is perhaps to try to break a kind of chicken and egg problem about who will begin. The U.S. producers can't expect that the desulfurization of coal will be done at the boiler, and the foreign consumers can't expect desulfurization will be done before shipping. I believe that kind of misunderstanding can happen if this problem is not mentioned and if there is no attempt to solve it. That's what seems to be a very important issue.

SENATOR PERCY: Thank you very much. There are, by the way, microphones on both sides of the room. Whenever Paul Simon and I see someone standing at the microphones we will alternate between our panel here and the floor. So, like a Quaker meeting, if the spirit moves you, just get over to a microphone and comment.

MR. EVANS: I might say a couple of words about the technology of the U.S. There was a comment made earlier in the morning about the use of high vol and high sulfur coal in the cement industry. Old Ben has been successful in selling to the cement industry here for years, while using high vol and high sulfur coal, and I think that the technology for the use of this type of coal in cement is very well developed. What we need to do is get the word out to people in Spain, France, and elsewhere that they should come to the

U.S. and find out how these coals are used, and we certainly intend to promote those kinds of trips.

POSITIVE ASPECTS OF ILLINOIS COAL

I'd also like to try to address the problem of reliability. In the Midwest we have a different type of business than you would find on the East Coast. Here we are accustomed to dealing with big mines, unit trains, high volume shipments, and fast loading. We deal in long-term contracts, and it is a business that is quite different from the eastern metallurgical coal type of exporting that has been the history of the exporting business, and I would like to invite you gentlemen if you haven't seen it, to come to our mines and find how we do deal in large volumes of coal over long-term contracts. We have built quite a reputation for long-term reliability to electric plants. I think that our labor situation has demonstrated that it is firming up, and that we have good strong support from labor, and I feel that we are in a position to be a very stable and a very reliable supplier for electric utilities and cement industries as well.

SENATOR PERCY: That would be very good.

MR. EWING: Senator, I would like to follow on a little bit of what has been said earlier. We have had the privilege to have some representatives from some of the countries that we have here today visit with us at Peabody, and who have seen some of our mines here in Illinois, and they have been amazed to see some of the good working conditions we have in Illinois versus some of the other states, and also, that we have coal that is 7-foot thick and that's relatively dry. In addition, the roof conditions are relatively good as far as our underground mines are concerned, which is a big plus. Also, I think that in the last few years productivity has increased here in the State of Illinois. We have had our "tons-per-man" day and our "tons-per-unit" shift for our underground mines increase over the last couple of years, and this is moving us into a more competitive position.

TRANSPORTATION FOR THE FUTURE

To echo what Carl Bagge said earlier, number one of the growing concerns, though, is that we need the ports improved. We need the silt issue from Illinois resolved; we need the port at New Orleans improved, so that we can offset what might be an impediment against us by taking advantage of the lower freight rates by being able to load these quite large ocean going vessels--a hundred and fifty thousand ton vessels. And as has been said before, the long-term supply problems do not worry us; we have dealt with those for years. In addition, we have high capabilities, we have large mines, we produce in large volumes, and we move in large volumes, so I think this is a plus on the side of Illinois. The thing that I heard this morning that we have to overcome, though, Senator, is the sulfur content in our coal. I keep hearing talk about 2.5%, 2%, or less than 2%, 1.5% sulfur, and Illinois coal; the preponderance of Illinois coal is 3% or more than that. That's a situation we have to overcome regardless whether it's through blending or whether it's

through improved technology. Things of that sort, we've got to overcome.

SENATOR PERCY: Thank you very much. We have a question from the floor. Mr. Josh Levin.

EASTERN VS. MIDWESTERN COAL

MR. LEVIN: Yes, Senator, I just wanted to reinforce a statement that you made this morning regarding the prospects for foreign development of technology to burn high sulfur coal more completely. The point was raised by you, Senator, that currently ships are incurring costs of $10,000 a day a more as they wait in ports for receipt of low sulfur coal from the coast. I wonder whether there are prospects for redirecting that $10,000 a day toward development of technology that would allow foreign coal buyers to have two options so they wouldn't have to wait at the ports on the East Coast, but they would have technology able to burn high sulfur coal from the Midwest which they could then receive much more quickly from the Gulf ports. And I guess my question is directed to any one of the foreign visitors concerning whether that is a sound proposition, and whether there is long-range potential for developing and even commercializing high sulfur cleaning technology.

SENATOR PERCY: Thank you very much, Josh Levin.

Suppose I throw one question out and then ask Paul Simon to step up and chair the balance of this panel, and announce the next panel. The question I would like to put to the potential purchasers from abroad is, would you be more inclined to buy Illinois coal if it were graded prior to sale so that you could be assured of certain consistencies within the products you purchased?

CONGRESSMAN SIMON: If I can rephrase the question and, incidentally, I would be interested if Carl Bagge would comment on this too, even though he is not on the panel. If I may just digress, Carl Bagge has really done a superb job for those of you in the coal industry. Generally we have worked together, and he has been both a talker and doer. But the question is, that when you buy coal from the United States, there have been some complaints that I have heard about the quality. Is that or is that not a problem, and is it something we should address?

MR. DANIELS: I could say that once in a while we have a problem. But I would say that any buyer of any product may have trouble in his purchases. We bought 7.5 million tons last year and we may have had 10 bad deliveries, and, of course, this is unusual when penalties have to be paid for them. And so I think we have to face the problem. We would prefer not to have it, but after all, it is not so serious.

CONGRESSMAN SIMON: Any other comments? Carl, do you care to comment?

MR. BAGGE: Well, we introduced sampling. Sampling is being introduced increasingly now at the piers to provide quality assurance for foreign customers. I think that is acceptable.

MR. DANIELS: Oh yes, we have dual sampling in our case, but the methods are not ideal for the time being or in any of the ports. I think that what we are going to have in several months in Norfolk will be the best solution to date.

MR. BAGGE: Well, it is being accommodated.

MR. EVANS: I might take a crack at that one. I think that in Illinois, because of the depth of the coal seam, most of the mines are fairly good-sized mines. The typical account that we have buys 1 to 3 million tons of coal a year, from one mine, or maybe two mines. The quality can be much more consistent when you're dealing with that sort of situation. I believe that most of the complaints on coal quality from the U.S. have come from Norfolk, where you have a number of companies selling coal. Many of them are brokers who are pulling together a railroad car from this mine and a railroad car from that mine. Bill Mason can certainly explain that better than I that the quality is very difficult to keep on a consistent basis. Now we are competing against South Africa, for example, where they have all of the coal that comes from one coal seam in one mine for a given shipment, or Australia, where you have the same type of situation. In a very large mine, they can exercise quality control at the mine, and the coal is much more consistent. I think that one of the advantages that Illinois coal has is that we can deliver large quantities on a large contract from one mine and maintain a very consistent quality. And we do. We're accustomed to having all of our coal sampled; most of the coal in Illinois is taken through a cleaning plant, so that we enjoy a high level of consistency.

MR. EWING: I think that carries forward from the coal in the past. Now as we know, most of the coal in the state is washed, and if we sold you a million tons of coal or maybe 2 million tons of coal, it would come, again, from one coal mine or two coal mines, and we would have a plant set up to produce the quality that we told you we were going to produce and you would be assured that you were going to get that quality. And we would know before it left the port what quality you would want.

THE SALE OF TECHNOLOGY OVERSEAS

MR. LEE: Gentlemen, someone said just a minute ago that there is a technology that would enable us to use high sulfur coal in the cement industry, and for us to come over here and to take a look at it and be convinced ourselves. I think that's one way of approaching the problem, and it might solve it. But I think the better way to solve this problem is for you to come to our part of the world and explain your technology yourselves.

In this connection, I would just like to make a few remarks on our cement industry which is your best potential for selling high sulfur coal. And if we are coming to the subject of the cement industry, I think our cement industry could potentially become a big buyer of coal because, right now, we have the capacity of producing 20 million tons of cement. I think we are one of the largest producers of cement although you might not know it. We produce it, and we consume a lot ourselves, but we export quite a lot of it.

COAL CONVERSION OVERSEAS

Starting in 1979 there was one cement producing company which experimented with conversion to coal. (There was a cement plant using coal in the beginning; because oil became rather cheap, they converted to oil, and now because of economics, they want to go back to coal again.) The question was, and is, where is the economic feasibility and how can they do this conversion job? But, apparently, the conversion is not all that complicated, so this manufacturing company was able to convert some substantial part of its plant to coal. And with this initial attempt, and because this proved to be very economical, the rest of the cement manufacturing companies began the conversion process. And last year, in 1980, out of the 34 kilns, 14 kilns were already converted to coal, and this year, we expect that 31 of the 34 kilns will be converted to coal. And next year, I am sure practically all (there are only four kilns left) will convert. And all together, we will be using something 4.3 million tons, nearly 5 million, for cement production.

KOREA'S NEED FOR RELIABLE COAL SUPPLIES

Since this is a new tradition, our cement people do not have the regular suppliers of coal. Most of the coal is bought on the stock market these days, and they are looking for a steady supply of coal, but I am sure if you can convince them that you can supply this coal at competitive prices, they will be the first ones who will be interested in talking to you. And I would like to urge you to go to them and just show them what you can do, and how they can secure their coal on a steady supply basis.

CONGRESSMAN SIMON: The gentlemen from Korea started off making a point that is extremely important, but it is unfortunately typical, not only in coal, but in much of U.S. industry, that we expect people to come over here and take a look at our products, instead of going over there. (The gentleman from the Department of Commerce is nodding in agreement back there.) Eighty percent of the American businesses that ought to be exporting are not exporting and that's one of the main reasons.

Let me add one final question that any of you can comment on this morning: You said that one of three reasons you are not buying coal from the U.S. is that you can buy it about $7 a ton cheaper from Canada and Australia. Now, your Minister from the Republic of China indicated last year you bought about a billion dollars of American coal. I have a hard time putting those two things together. If our prices are not competitive, it does not make much sense for the Republic of China to be doing that. Is the gentleman from Korea right, or may I address this to you, sir? How do we mesh these two facts, if I may call them facts?

RELIABILITY OF SUPPLY AND DIVERSIFICATION

MR. CHENG: Mr. Chairman, there are many factors involved in the purchase of coal, especially in long-term supply. And as we discussed this morning, reliability is one of the very important factors, as is diversification, so that we are buying coal from a number of places, including Australia, South Africa, Canada, and the United States. However, we only compare the quotations from a

certain area. For instance, we compare the South African supply quotation only with the South African coal quotations because, as I said, diversification is very important, and sometimes we are willing to pay a premium just for the privilege of diversification. But I think after this morning's session and the encouraging remarks by Senator Percy and Governor Thompson, we have more confidence in the coal here.

REDUCING COSTS THROUGH TECHNOLOGY

However, economy still plays a very important role. So I think the only way to cut down the cost is to have a good, new infrastructure including the deepening of the ports, as we discussed, or even other technology, including the slurry pipe form of delivery of coal. Since three foreign panelists are from Pacific-based countries, any cost reduction in ocean transport will be very important. If the new technology of slurry could be used in the future, then we could use larger vessels; we could even consider using the largest vessels to go around the Cape instead of going through the Panama Canal, which limits vessels to 65,000 tons. I think all these things should be considered and, therefore, I would recommend that a task force be set up in the study of the exportation of Illinois coal. Costs should be integrated for an overall approach to the problem so that any users will have a real in-depth view of the whole situation instead of only a piecemeal one. And I think as one of the purchasers of coal, we might also consider joining your study. Thank you, Mr. Chairman.

CONGRESSMAN SIMON: We thank all of you very, very much for your participation here. And now we will ask to come forward, Mr. Earnshaw, Mr. Allen, Mr. Bagge, Mr. Long, and Mr. Grossling.

PANEL ONE-B

PRIVATE AND PUBLIC ACTIONS FOR INCREASING HIGH SULFUR COAL EXPORTS

CONGRESSMAN SIMON: Mr. Long and Mr. Grossling each have papers. We will enter their full papers in the record, and you can briefly summarize the papers, if you will. I will call on Mr. Long of the International Energy Agency.

MR. LONG: Thank you, Mr. Chairman. In view of the time factor, I thought the most interesting thing to do would be to say a little about the IEA coal research itself and then to say something about the conclusions of our work, which touch upon the topics of this conference today. I will leave out certain pages, which are the most important part and show how we arrived at those conclusions, but I will leave my entire text for inclusion among your conference papers.

IEA HISTORY

IEA Coal Research was set up in London in 1976 shortly after the International Energy Agency in Paris was established. Its purpose is to look specifically at ways in which coal can be promoted to replace imports of oil and gas in the major industrialized countries over the long term. The organization now comprises four services: the technical information service; the world problems, reserves, and resources data bank; the mining technology clearing house; and the Economic Assessment Service, which I will refer to as the EAS. That's the one I work for. EAS is currently covering numerous countries, including, of course, the United States. The EAS has concentrated its main efforts to date on analyzing the costs of new coal using technology in more efficient problem-solving for power generation and gasification and in liquefaction. In addition, there are services on the economics of coal use in production and industrial markets and on the costs of environmental control in colonies. Finally, in coal supply there is a subsection in which I work (transport and trade) which looks at the economics of the entire chain of production from mine production through the land and sea transport of coal to consumption and delivery prices in the market.

My job has two aspects. One aspect is to develop a framework of thinking about low energy demand and supply in addition to low price, which clearly affects the more specific analysis of coal economies which EAS is carrying out. This is done by developing an originally desegregated global energy model called EDSAF which stands for Energy Demand Supply Analysis and Forecasting Framework. The other aspect looks specifically at restraints on internationally-traded coal.

GLOBAL IMPORT PREDICTIONS OF THE IEA

Some forecasts have come out of my work on globe-managing economic supplies which are at the higher end of the range of forecasts in the world coal study. (I am now in the process of examining

possible physical and institutional constraints which would prevent these high levels of trade from being attained.) My work concentrates on the costs available regarding coal in the sulfur and Btu categories from major exporting countries, which are particularly relevant to this discussion. The basic assumption in this macroeconomic and energy analysis is a rapid rate of economic growth in the United States after the subdued growth of the 70's. Additional assumptions are some improvements in the energy market compared to what it has been historically, and rapid expansion of unusual power and sustained increases in hydro-power, gas and coal. The lower rate of increases in the world output or greater energy dependence would detract from coal demand. On the other hand, the perhaps more likely shortfall of all high rates would increase the importance of coal as the major national energy supply. In the trade analysis, it's worth noting that on the importing side there is or will be a rugged rise in Western European and Japanese coal imports and also relatively large increasing imports in Southeast Asia, and to a lesser degree in South America, particularly in the 90's.

EXPORT POTENTIAL OF MAJOR PRODUCERS

On the exporting side, the export potential of four major non-Communist regions is particularly interesting when seen relative to that lesser demand. Exports from Australia turn at a full 80% in terms of total production, and from Canada and South Africa it is 35-40%. In the case of the U.S., however, the proportion of production accounted for by exports, while rising from its current level of 78%, is still only 40%. Despite having reserves large enough to expand well beyond their own levels indicated, there are signs in Australia, Canada, and South Africa that limitations could be imposed on exports for reasons to do with long-term national interest, balanced regional development, and availability of manpower. The implication is that the U.S.A., with less pressure of competing demands between exporters and domestic markets, would have greater flexibility in meeting excellent opportunities.

This leads us straight into the questions of importer preferences, quality, and costs. The fact is that current major imports are not attempting to favor U.S. coal, partly perhaps because they don't want to replace dependence on Middle East oil with a comparable dependence on U.S. coal, but more specifically because struggling Canadian, South African, and Australian coal exports are entirely no sulfur and can be delivered at a price that is less than those of the U.S. delivered prices even when long sea journeys are involved.

CONGRESSMAN SIMON: I hate to interrupt you, Mr. Long; I wonder if you would just give us a capsulized summary in two minutes or so in order that we can get some discussion from the panel and from the audience here?

FUTURE PROSPECTS FOR ILLINOIS COAL

MR. LONG: Yes. What I was going to say was that though it isn't very promising in the short term for coal in the Illinois Basin, one needs to look at the possibilities of high sulfur coal beginning to be in demand in the long term with its commercialization through new technology which will solve the environmental

problems associated with its use. These technologies, which have already come up this morning, include beneficiation and scrubbing as regards combustion, gasification, and liquefaction.

At this point I did want to review EAS's own work, but instead, I'll pass on very quickly some conclusions that we have come to so far. While medium sulfur coal may have been available to the less costly beneficial FGD system, there was widespread use of high sulfur coal in the commercialization of boxcar FBC and gasification combined cycle, the power generation substitute for natural gas, and liquefaction. The time-frame of the first two may be within this decade, but there is some discussion about when the implementation might be. The greater demand of high sulfur coal to be made in the early years of the next century under the pressure of high energy use may cause deposits and natural sources to run out. When the unconventional sources naturally occurring liquids from conventional sources, there is a great possibility of economic coal liquefaction. The point has been made by the International Institute of Applied Systems Analysis in a recent study looking well into the 21st Century, that within the next 50 years coal will become too valuable as a source of liquid to be used in its conventional application, which would include power generation--which would then be increasingly accounted for by nuclear cell and possibly other renewable technologies. So just to summarize the short-term effect doesn't seem very encouraging, but the long-term outlook certainly is encouraging.

CONGRESSMAN SIMON: Thank you very much, Mr. Long. I understand Mr. Robert Parks who is supposed to be a part of the last panel is here now and we would be happy to have him join us. And now we turn to Dr. Bernard Grossling who is with the Inter-American Development Bank; if you would summarize, Dr. Grossling, your papers, we will enter your full text in the record of the proceedings.

DR. BERNARD GROSSLING: I will be very brief. I understand your urgency. First, I want to thank you for allowing me to be here because we share, very much, your concern and also we enjoy very much the participation of the private sector. In Latin America many of the countries rely very heavily on the private sector. Now, I want only to highlight something which I think is very important, which is that to understand coal you really have to look at the broad picture of the various energy resources. This is quite clear in Latin America. So if one looks at the market for coal in Latin America, one finds that there is a place for coal, but it's not as large as, let's say, Korea, Japan, or Western Europe, because there is a great deal of oil left; there is a great deal of hydro-electricity; there is a large potential for biomass; and there is a great deal of gas.

PROSPECTS FOR COAL CONVERSION IN LATIN AMERICA

But, the important part is, I think, as the gentleman from Korea mentioned, that the U.S. should try to sell the technology for the use of coal because there are many applications. For instance, there are large isolated mines in coastal positions in Latin America that are operated on imported petroleum products: fuel oil and diesel oil. I think these mines could be converted to the use of coal. But what will be foremost in the mind of any user in Latin

America wishing to convert to coal would be, first, a commitment of long-term supply. That would be the number one concern--a long-term supply commitment, so that you know you are going to have coal for a long time. The second necessity would be price stability in the coal, and I think in the third place, it will be about something which you have been dealing with--the question of sulfur. I think, in that case, sulfur would be our last problem. The primary concern is commitment. If you're going to start importation and, at once, transform your boilers, etc., to accommodate, consume, coal, you have to have the assurance of the supplier. And, I think, seen from the viewpoint of the rest of the world, that the other countries hope that the U.S. will begin exporting some of its coal because over 90% of the world's coal resources are in three countries: the USSR, the United States, and the People's Republic of China. Now, the amount of coal is probably from three to ten times greater than the amount of oil, depending on whom you ask. If you ask me, I would say only three times more than the amount of oil. But still it is the fuel, the swing fuel, of the next fifty years. So the position of the U.S. is vital, whether the U.S. is going show a willingness to export coal, or not, because I don't think that we expect that the USSR or the People's Republic of China will share their coal very much. In the long, long run of the course, we will be beyond coal. We will be left with biomass, with solid energy and fusion. So, there it is, directly speaking.

CONGRESSMAN SIMON: You have done exceedingly well, and we appreciate it. Any comments from members of the panel. Carl Bagge.

MR. BAGGE: Well, I am sort of disappointed to hear that the outlook for Illinois coal, from the IEA's perspective, is not an encouraging one in the short term. Well, in the coal industry, we only deal in the short term. There is no long term. They say coal diggers have got to be optimists because it's always going to happen in the future, or else we wouldn't be in the business.

ILLINOIS COAL AND ILLINOIS UTILITIES

I would like, if I could, to pick up on a question that Harley Williams, who spoke earlier today, asked. I thought it got down to the vitals when Harley addressed Senator Percy. He said, "Here we are trying to promote high sulfur Illinois coal worldwide although the IEA says this afternoon that it isn't too promising." And he said that the largest single utility in the State of Illinois isn't burning Illinois coal.

There was no answer; I didn't hear an answer to that, and I think it requires a little examination by this panel and by others here because, it seems to me, it gets at the guts of it. I've been trying to listen attentively and I've heard that you can think about the cement market, but that's a very limited market. When we're talking in terms of capturing the industrial market, the utility market of the free world, to talk only about the cement industry makes the scope very narrow, especially when you talk R and D as if it's going to be in the long-term future.

RESTRICTIONS IMPROVED BY THE CLEAN AIR ACT

Well, I submit that there is another alternative. It's not a very popular alternative. The press doesn't like it; politicians, with all due respect, don't like it because they are viewed as coming out for dirty air. But in our simplistic minds, we have characterized the Clean Air Act as the Clean Air Act, not as a regulatory means by which our society attempts to achieve the goals of cleaner air, but rather, as the Clean Air Act, which poses an impossible burden on politicians such as yourself who have to balance our energy, our economic, and our national security goals. I submit, therefore, that this conference ought to give some thought to the rather unpopular and unpleasant, perhaps (as viewed by the media), alternative to having something stretched out of the future such as R and D or limiting Illinois coal to the cement market worldwide. I submit to you, sir, and to the group here that we do have an alternative and that is when Congress is forced, however reluctantly, to view the underpinnings of the Clean Air Act this year, we should balance or seek to balance the competing national goals and set our standards specifically for sulfur, for SO_2.

HEALTH ASPECTS OF SULFUR

We can now tell the American public with more reassurance that we don't see the kind of a relationship that we saw in the horror stories back in 1970-71 when we thought thousands of people would die from SO_2. It's not true. We have established that it is not true. All we need is for the public to force the Congress into a realistic balancing of those goals and I think, then, you have a bright future for Illinois coal. But short of that we are going to be limited to more R and D talk, throwing billions of dollars into the problem, and trying to sell the world cement industries Illinois coal. Thank you very much.

CONGRESSMAN SIMON: Will you permit the Moderator to make a comment here?

MR. BAGGE: You have also got to vote on the Clean Air Act.

CONGRESSMAN SIMON: I think we have to be very realistic about what's going to happen and what can happen, and it's an easy thing for a politician from southern Illinois to get up and say we are going to change the Clean Air Act massively, but--and Carl, you are a realist--it isn't going to happen. Now, there can be some modifications; for example, when a new plant opens and is meeting the standards of that time, I think they ought to be guaranteed that for ten years or so those standards stand. I think there can be some other slight modification, but I don't think that any massive change is likely to occur. And I think those of us who have been pushing coal ought to be very realistic about that.

Then, the second question is, what can we do about that utility in the State of Illinois? One of the things I think we can do in Illinois and in Ohio and Indiana and other states right now is to say to Commonwealth Edison, or any other utility, if you get Montana coal, Colorado coal, coal from the West, you can just automatically add $14-$18 a ton for transportation here to the State of Illinois, but if you put on a scrubber, or a fluidized bed, then you shouldn't have to go through lengthy hearings with the Commerce Commission.

Now, I do not suggest that we can equitably and fairly take away from the utilities their right to add the "pass through" for transportation costs. I do suggest that it's in the interest of the consumers in Illinois, as well as the coal industry in Illinois, for us to permit them to add on the costs of the scrubbers, or a fluidized bed, or that new technology. And I think if we made that change, you would see a substantial increase in Illinois utilities using Illinois coal.

MR. BAGGE: I don't disagree with that at all, but what if it isn't necessary, and what if the standards are indeed set unrealistically high, and there is no necessity for going through the "Mickey Mouse" at all? Then, I submit that there is a far more practical approach, and this is another issue on which you and I disagree, I'm afraid, in addition to the black lung, Paul. But I do believe the Reagan administration, under the leadership of Jim Watt, the much maligned Jim Watt, who the press, the media, has attacked, has got the courage to do precisely what you say is impossible, and that is to make epigeniological studies of the scientific data which we have in hand now which demonstrates that the fear, of the costs connected between SO_2 and human health were unfounded.

I don't think the public understands that the Clean Air Act, the underpinnings of the Clean Air Act, is predicated upon the limited economic growth of the country, and I don't think that the public will take it because we can achieve the goals of Clean Air and also have growth. The new source performance standards that EPA has promulgated seek now to give the capital to the utilities to abandon the old oil-fired plants and give them the capital to build new coal-fired facilities so that we will have fewer total emissions with coal than with the existing generation of oil. It's a matter of getting the capital to the utilities, but we can achieve clean air with growth and not limited growth.

And I think unless the public understands, and the media understands, that we have strapped ourselves as a society and limited ourselves to achieve one societal interest, not clean air, but pristine air, at the risk of new growth, in higher PSD areas or in non-attainment areas. Once that's understood, I think the Congress will have to respond to the public which are going to say, "We don't want it that way." So, I am more optimistic about the chances of coming to grips with this problem, and, therefore, about the future of Illinois coal because I think the Reagan Administration is going to have the guts to provide the leadership to make fundamental changes in how we as a society set about to achieve clean air so that we balance that concern with those of energy, economy, and national security.

CONGRESSMAN SIMON: On one issue, Carl and I are agreed and that is that we can have national growth and clean air. There is no question about it. Now, if we can just shift back to exports here, which is the function of this conference?

MR. DANIELS: I just want to make one final comment, if I may, and that is something that does come out of this and which I think is interesting, and is a ground that does need to be examined, and that is that the whole philosophy of utility regulation does stand in the way of making these concessions, that Carl was referring to, and that is a serious challenge.

CONGRESSMAN SIMON: Mr. Earnshaw.

MR. EARNSHAW: Well, I too think it might be time to return to the question of exports. There is no question that the Reagan administration knows that coal is fundamental to the whole of our export intentions in the next 4, 8, 12 years, whatever they are. It's very clear to me as I've been around the country, in the last 4 weeks, that the realization is growing every day that exports in the 1980's are the growth market. And it's just as true for coal as it is for leather belts from Richmond, Indiana. There is just no question about it, and the awareness is there.

But I'd like to make a point, too, that I think you will remember, and that is that coal was a recurrent campaign theme, when a candidate was asked about an energy policy. I remember George Bush saying, "Coal, coal, coal, coal." It is very much in the forefront. Another thought is that I've been terribly impressed this morning to hear Illinois saying to the world, "We know the kind of coal we've got, we know the advantages that we have such as big mines, consistency, and all the rest," and I have a feeling that the State of Illinois isn't going to sit around and wait for the government in Washington to do something. You are starting what you have to do to sell your product, in this case, coal from the State of Illinois.

Another point that I want to make is that I have found, in my travels both to New Orleans and later in the week to Norfolk, enthusiasm in those ports for what they know they can and want to do to facilitate the great concern, which is coal loading; the enthusiasm is there. Those guys know their potential; they know the opportunities, and they are getting their act together to do it.

STATE INITIATIVE IN MARKETING

Finally, let me just talk for a minute about what I perceive to be the role of this Administration in coal export policy. First of all, the Interagency Task Force, which was, and still is, the Cabinet's Committee on Commerce and Trade, which is chaired by Secretary Baldridge, has been charged with the development of coal exports policy for this Administration. My own view for the government role is, number one, that it act as a catalyst. I can see Illinois doing its part and Kentucky doing its, and not waiting for the government to do the whole thing. I think the government can always get out of the way. Get some of the regulations out of the way that aren't necessary. That will facilitate the private sector in doing what it wants to do. So for coal as an export, a policy that is needed from the federal level is developing; it is coming. The government will plan a proper role, but, to repeat myself, it's exciting as hell to me to listen to the Governor of the State of Illinois say in effect, "I'm not waiting. We've got our program and we're moving." And I don't think that the potential for Illinois high sulfur coal is long term at all because Illinois is going to do something about it.

CONGRESSMAN SIMON: We have two questions from the audience, and then we will try to get out of here reasonably on time so John Castle can take over.

SPEAKER FROM THE AUDIENCE: Do you want us to identify ourselves?

CONGRESSMAN SIMON: If you would, identify yourselves for the record, please?

SPEAKER FROM THE AUDIENCE: All right. Duane Thompson, I am from the Congressional Research Service. One of the recommendations of many of the witnesses this morning is that high sulfur Illinois Basin coal be blended with lower sulfur coal in order to come out with a "blended product," or "U.S. product" that would meet some of the limitations of potential foreign consumers. My question is what kind of incentives--given the fact that there is a tremendous amount of idle capacity in the eastern mining industry right now--exist, or what incentives can the administration create which would induce eastern producers to blend their low sulfur product with high sulfur Illinois coal, not only between one company and another, but also in companies that have multi-state operations and which would like to blend their coal right now but can't afford to because of costs?

CONGRESSMAN SIMON: Yes, Mr. Allen?

MR. ALLEN: This question of blending has come up a number of times and I had it on my list of things I thought we could discuss on this panel. The question of blending in the metallurgical coal procedures, as you probably know, is a highly technical one that the Japanese most recently have brought to a high state of technological advance. In part, based on the work that they have done in Japan, it is not a simple matter simply to take coal from Illinois and blend it with coal from West Virginia, and end up with an average volatile matter or an average sulfur content or an average anything because, in fact, the blending process doesn't work that way. Now I am no expert on the subject of blending, but I do know that there are a number of questions, when you talk about putting coal into a boiler, concerning ash analysis and the performance of the coal in the boiler that go in complexity way beyond simple straight-line averages on volatile matter in sulfur, and, therefore, the question is a highly technical and highly complex one, and from what I have been able to determine, from talking with people, the state of the art is about where the state of the art in metallurgical coal blending was in the 1940's. And we've got a long way to go before we can even begin to know what we are doing when we start dumping two coals together.

Now, as far as incentives go, I don't think there are any incentives because there aren't even any capabilities to do it except perhaps if you go to the met coal piers, and that's an expensive proposition. And I think a number of people, including Ray earlier, have pointed out that there still is availability of low sulfur coal from South Africa, there will be from Colombia and from Australia, and that there is no real incentive for the buyer to go through that technological process. So, if we want to do the blending, as was pointed out earlier, it is really incumbent upon us to develop the technology and then market that technology overseas to buyers and show them that it is in their economic and technical interest to use it.

MR. EARNSHAW: I just had one thought that occurred to me, and I think you have alluded to it. The best incentive in the world is not an incentive, in my mind, that the government provides; it's an incentive that the buyer provides. And I think I heard one of the gentlemen say earlier that there are considerations in the acquisition of coal for one's country that go beyond just simple prices. It strikes me that the buyer is going to want to trigger the activity of an area where one-third of the U.S. supply of coal rests, which is in the State of Illinois. And I suspect that there is

something in the buyer mechanism that is going to provide a greater incentive than anything that the federal government could ever try to do.

CONGRESSMAN SIMON: Yes, the gentleman over here.

SPEAKER FROM THE AUDIENCE: My name is Bill Smith; I am with Pecton Coal Sales, International, and I would like to direct my question to the gentleman who read the paper from IEA. He mentioned that they did some work on the costs to mine coal in various producing countries and on the transportation costs to the consuming country.

FACTORS DETERMINING COAL COSTS

There is a growing realization in the United States among more than a handful of the large utilities that you can no longer take the delivered cents per million Btu of, let's say, five coals, or any number of coals, select the coal that has the cheapest cents per million Btu and say that that coal is your best economic choice. There has been some work done in this country by a few of the larger utilities that indicate that parameters such as slagging in a furnace, fouling, ash disposal, and flue gas desulfurization must be considered; of course, we all know that these add to the costs of the consumer. So, oftentimes, the largest cost is not handling the coal at the dock or storage yards, but the largest cost is in using the coal. And my question is, are any of the utility companies in the foreign countries, particularly in Europe, coming to this realization that, although a coal may be cheaper on a land basis, it may be, by far, the worst choice because of, let's say, slagging problems, or reduction of utility plant availability, or maybe even the cause of de-rating the power plant?

WORLD COAL PRICES VS. U.S. COAL PRICES

MR. ALLEN: I think the problem is that there is such a wide availability of cheap coal from a number of sources at the moment; I'll summarize some figures here, which I would have given Mr. Simon, of the dollars per ton: Australia--$10-$14; Canada--$15-$19; South Africa--$10 or less; against the U.S.A.--$11-$33. And, it seems to me, that's going to be the main problem for the U.S. in trying to promote its exports. There is such a wide range of cheap, low sulfur coal from a number of major exporting countries, and that is the short-term situation. Given the kind of economic growth "scenarios" that we are working on (within ten years, one might be back in a situation where demand is growing very quickly and therefore supply is becoming relatively scarce), then the kind of consideration you are introducing would become a factor. But as Mr. Bagge says, you know in the long term we are all dead. I suppose it's not such an encouraging thing to say that 10 or 15 years from now you might have a better exporting opportunity on your hands.

CONGRESSMAN SIMON: We thank you. We will take a twelve-minute break right now, and then John Castle will take over the next panel.

PANEL TWO

DEVELOPMENT OF INTERNATIONAL MARKETING MECHANISMS FOR HIGH SULFUR COAL

MR. CASTLE: During the morning and afternoon sessions, the advantages and disadvantages of Illinois coal were quite clearly outlined. The questions which this panel will be addressing are, given those advantages and disadvantages, what mechanism could the Illinois producers use to increase their international market share, and what role does the government, federal or state, have in assisting producers in achieving that objective? I'd like to go right into the program, starting with Illinois State Senator Ken Buzbee making some opening remarks and move right through each one of the panelists, who will make brief remarks; then we'll open it to questions and discussion among the panelists. Senator Buzbee.

THE DOMESTIC MARKET AND ILLINOIS COAL

SENATOR BUZBEE: Thank you, Mr. Castle. I think it's only fitting and proper that, in a conference dealing with coal exports as they pertain to Illinois coal, that a few brief remarks should be made about domestic markets. In a previous panel, Congressman Simon talked about the add-on costs for scrubbers being passed on to the consumer. As a matter of fact, the State of Illinois imported 15.5 million tons of western coal to be consumed in the State of Illinois last year. That was low-Btu coal only, high in moisture content, low in sulfur, and it included a very severe severance tax imposed by the States of Montana, Wyoming, Colorado, etc. The people of those states thank the people of Illinois for paving their roads and for operating their school systems. Concerning that 15.5 million tons of western coal that Commonwealth Edison and Illinois Power burned, our consumers, particularly in the northeastern part of the state, are paying severance taxes on this--for our coal miners to continue to be less than fully employed. Congressman Simon made reference to the scrubbers and the fluidized bed; I am the sponsor of a bill in the Senate this year, one that's already passed the House, that will allow the construction work in progress on pollution control equipment, to be passed on by the Illinois Commerce Commission to the consumer. I have also in the past sponsored bills which would eliminate the transportation costs in the fuel adjustment clause from being automatically passed on since the utilities would have to go before the Commerce Commission to get that ability. The bill lost last year by one vote, and this year by eight votes in the Senate. So, as you can see, the Commonwealth Edison lobby is apparently getting stronger. I am not saying that these are the answers to all of Illinois' domestic market problems, but at least, I think those two attempts should help.

Mr. Bagge spoke briefly about the Clean Air Act, and I concur with him that there needs to be some loosening. I may not advocate as strong a backing-off as he would, but I, in particular, think that in the new source performance standards that we ought to reduce the percentage removal requirements for the sulfur content from something a little less than the 90% we have now. We can do that and obviously still meet the standards of the National Air Quality Act. One thing that I am adamantly opposed to is the complete

elimination of all percentage removal requirements for sulfur, because if that happens, obviously, only western and Appalachian eastern coals will be compliance coals, and Illinois coal will be *left out in the cold.*

I have one other thing to say about the metric market and that is that it's very popular for any politician these days to talk about coal as the salvation of our energy problems. Yet, the fact of the matter is the Reagan Administration in the Department of Energy budget cut in half the dollars available for coal research while, at the same time, multiplying by five the dollars available for nuclear research. So I wonder if their heart is where their money is.

THE FOREIGN MARKET

As far as the foreign market is concerned, we need to know how our coal can be utilized in a variety of combustion technologies. It is imperative that we understand the problems with burning Illinois coal as well as what is being done to solve these problems. Basically, we must let international coal users know that Illinois wants to sell them coal in one form or another and that Illinois has the people in government and industry ready and able to help coal buyers.

OFFICE OF COAL COMMERCE

In this session of the General Assembly, I have sponsored two bills which have passed the Senate to promote coal development in Illinois. Senate Bill 404 would establish an Office of Coal Commerce in the Department of Commerce and Community Affairs, Director Castle's department. This office would be visible to foreign coal buyers and work aggressively to promote coal development in Illinois. The impetus for this came about directly because of Illinois" loss to the State of Kentucky (my good friend Art Nicholson here was the project director who stole that project from us) of the Eastern Texas project, a 5 billion dollar project. Illinois needs to do something to avoid these kinds of losses in the future. This Office of Coal Commerce would be one of the ways to preclude that sort of thing happening in the future.

The duties of the office would include showing potential users of our coal that Illinois can help secure a stable, economical supply. This duty is even more crucial today if Illinois is to become a viable supply source for foreign markets. Second, it will help foreign and domestic investors who will locate coal conversion and processing plants in Illinois. Even if rural Illinois coal cannot be shipped in large quantities, there are still ways to clean our coal or to convert our coal to fuels which can be marketed. This area could potentially be the best thing that could happen to Illinois coal. The Office of Coal Commerce would also assist industry with regulatory compliance products, so that these procedural issues would not stand in the way of Illinois selling its coal.

By providing a distinct office and staff to work in the area of coal promotion and regulatory assistance, Illinois can show the world that we are serious about developing our coal resources. By utilizing the Department of Commerce and Community Affairs' foreign offices (with offices in Sao Paulo, in Brussels, and in Hong Kong),

an existing organizational structure could be brought to bear on coal development issues.

Next, Senate Bill 405 would provide for an income tax credit of 5% of the amount that industry spends on equipment designed to use Illinois coal. It would try to get those industrial boilers to convert from gas and oil to coal and give them a tax incentive to do so. Companies would also receive a 20% tax credit for Illinois coal-related research approved by a coal research board. These tax provisions would give industry additional incentives to continue to use Illinois coal. Passage of these bills would show that the state is willing to invest in our coal industry by stimulating demand for Illinois coal. These provisions can be very powerful in letting others know that we are intent on using more of our own coal.

POSSIBLE FORMATION OF COAL RESEARCH BOARD

Another bill which was not approved was Senate Bill 402, which I understand the Governor in a press conference said he thought ought to be revived in the House. This would authorize the formation of a nine-member Coal Research Board consisting of representatives from government and industry. The Coal Research Board would assist coal utilization research in four ways. The Board would, number one, assess the areas in which research is most needed and most effective, both in the short term and in the long range. But we can't wait for 15 or 20 years. On the basis of this assessment, the Board will develop a coal research agenda that will set the goals of Illinois coal research for the next several years. The Board would assist the coal institutions in Illinois in coordinating coal research projects to maximize their overall progress toward the goals of the research agenda. Second, since reference was made earlier by several of the representatives of other countries to the fact that we need to give them some possible solutions as how best to use our coal, this Coal Research Board ought to be writing an agenda that would pose questions and answers that would show them how they can best use our Illinois coal. Third, the Board would provide state funding for specific research projects that are considered most important and have not received adequate funds from other sources. Finally, the Board would encourage increased funding participation from the federal government, other states, and private industry. Included in this structure would be cooperative research involving the operation of private and federal demonstration projects that are designed to utilize high sulfur coal.

In summary, the state in cooperation with industry can exert a positive influence on resource development in Illinois. We cannot, however, wait for this influenc to come about. We must be aggressive; we must have a purpose and a goal in mind. We cannot wait for people who want to locate a plant in Illinois to come to us or for new technologies which can burn high sulfur coal. We must develop those technologies, and we must go after those people ourselves. Illinois can be active in the international market place to ensure that Illinois coal is used. Thank you.

MR. CASTLE: Thank you, Senator. Arthur Nicholson, Commissioner of the Bureau of Production and Utilization.

MR. NICHOLSON: Thank you very much, sir. It's my pleasure to be here. Ken made a very stirring speech, but there are a couple of things I might add that might be useful; I hope they will be useful.

I covered several of them in a speech out here last month at lunch; so maybe some of you heard that.

Kentucky has a bit of a dichotomy. We have high sulfur coal, if you will, in west Kentucky, and we have low sulfur coal in east Kentucky. Of course, that's not totally true because in east Kentucky among the low sulfur coal, we also have some high sulfur coal, and, in fact, blending does go on. In a coal washing plant you will frequently see an operator blending his .7 or .8 coal with 1.2% or 1.3%, so that he can end up with a little less than 1%. So there is some of that going on. I am a little skeptical about whether this is really a fruitful process in trying to blend 1% sulfur with 3-5%, but that's not my main point.

We have a further dichotomy; we have big operators and small operators. Peabody Coal and Allenton Coal are the big companies and are terribly important to Kentucky. We do everything we can to help them even though they don't need much help from us. On the other hand, the Kentucky coal industry is also characterized by small independent producers and they do need our help. They're generally very efficient when it comes to producing coal, but not very efficient when it comes to marketing it. This is one of the mechanisms that we have been working on that was mentioned by your Governor today. We decided sometime back that in our Small Operator's Technical Assistance Program we needed a mechanism to help them achieve more stable markets. When the coal industry goes up and down, the big companies tend to be a little more stable, but the little guy is out of business at times and on relief, and we are very concerned with trying to provide some stability for the little guy.

MARKETING COOPERATIVES

Now, there have been several suggestions over the years, and I'm sure that you have heard them here. What we need are marketing cooperatives--private enterprises. Economists for all these years, and at my age that's a long time, had a little trouble with that kind of marketing mechanism. I do say that I got a little more receptive to the idea when the Appalachian Regional Commission offered me $200,000 to establish a coop. I took the money and am in the process of establishing a marketing coop for small producers (and I would add we are reasonably well under way). As a matter of fact, establishing a coop is a piece of cake. It can be done in a very short time if you have one thing--a market for coal. The rest of it is easy.

The question was, and is, where do you get a market? So we set about talking to utilities and, of course, Bill Mason and Wayne Ewing and his folks had already loaded up their coal, but we thought there must be some other market that no one had. And about that time a delegation from Italy approached us and asked us if we would help to get some coal supplies. In order that they could reach our independent producers, we agreed to do so, and have established a "not for profit public authority," if you will, to help as a conduit between the cooperative and the Italian steam coal buyer. I would also like to mention a couple of other things that we think are important that might be useful to you and which get us a lot of mileage.

The first place I met Ken Buzbee was in Columbus, Ohio, in November of 1979. He had this idea that there ought to be some way the states that had these mutual problems could get together and

talk about them. We now call the organization that grew out of this the Interstate Coal Task Force. Ken was the first President. He did a superb job. Kentucky is running that task force this year, and we think that's a very important means for us to meet and talk with environmental people at the state level and national level, and energy people at the national level, both in the Administration and in the Congress. We interact with them and express our points of view.

KENTUCKY COAL POLICY COUNCIL

So we have, we think, had some influence with these interactions. At least Kentucky feels we've gotten so much out of the program that we have a Coal Policy Council of some 33 industrial leaders: coal, rail, banking and others. The coal people are sent from the large companies; some of the bankers are from other states. In fact, it's probably a more cosmopolitan group than the Interstate Coal Task Force. The group meets at least quarterly and has committees established. This group is particularly helpful because it helps us develop policies. Our regulators are in the process of enacting and carrying out those policies rather than, if you will, developing policies with which they're also going to regulate us. We want industry to have an input into that.

These two things, we feel, have been very important to us and since we have a large number of small operators, we also have a small operator advisory council that advises me on matters. I meet with them quarterly and they explain essentially the kind of problems that plague the small operators and offer solutions. I think after listening to the Governor's speech today and seeing what is going on here that I need to quit talking and get back to Kentucky and get to work to keep you all from running over us. Thank you very much.

MR. CASTLE: Thank you very much. I only wish that were true. Bill Mason will be next. Bill is President of the Coal Exporters' Association of the United States and testified this morning. Bill.

MR. MASON: Thank you, Mr. Chairman. It is a real pleasure to be here, and I certainly want to congratulate the Senator and all the people involved. I have attended a lot of conferences in the last two or three years and I don't think I have seen as many experts in my life as those here on these panels and on this program. The Senator and all of the staff certainly should be complimented on bringing together such a wide variety of real experts on this market.

I have submitted for the record a report that I will certainly not try to cover in any detail at all. It covers six factors. I am only going to take up one of these, or possibly two of them. One of them is what my company is doing with regard to helping this situation. I do want to say that on the upper Ohio River my company has put in two large docks (one on the Kentucky side and one on the Ohio side) where we load low sulfur coal and from which we are shipping, and will ship, low sulfur coal down the river. We also loaded a ship the other day in New Orleans, combining high sulfur coal with low sulfur coal, and it's being sold on the export market. So it can be, and it is being, done.

THE ILLINOIS BASIN SITUATION

Now, Illinois Basin coal historically and predominantly served domestic industry and the utility market, and to some extent, the metallurgical market in a predominantly midwestern area. This coal has been a good and dependable fuel source for this area and has to a great extent--until the last 10 years or so--satisfied the area's productive capacity. Unfortunately, while the United States' production has increased in recent years, Illinois Basin coal has not enjoyed increased demand. I feel that this has been due to several factors and some of these we haven't really touched on today. Illinois Basin coals have generally moved by river and rail market within several hundred miles of here. They haven't been going to the export market. Illinois Basin coal has heretofore not moved to the export market because of its location in mid-America. But, in addition, steam coals until very recently have not been exported to any extent anywhere except to Canada. Also, Illinois Basin coal has been more affected by the influx of gas into the metropolitan areas, such as Chicago, because of the environmental restrictions instituted by EPA, and the higher sulfur content in most of the coals originating in that area.

From a reserve standpoint, this area is a vital energy source, estimated to have over 200 million tons of identifiable, recoverable resources. The area has a number of our nation's best and most qualified producers, and a mature and stable labor force. With the growing demands for steam and industrial coal abroad, and with a transportation network comprised of the Mississippi River and a progressive railroad system, it would seem that there is no reason why these coals of better-than-average quality should not find a place in the energy-short areas of Europe and the Far East. The one and only reason why Illinois coals would not be marketable in the world market is because of the high sulfur content which we have talked about.

SULFUR CONTENT PROBLEM

Export coal buyers generally fall into four categories of sulfur specifications: under 1%, up to 1.5%, 1.5 to 2.5%, and 2.5% and above. Illinois Basin coal by itself cannot fit easily into the first two categories. Some coals from this area might fit into the third category, but more fall into the last category. The largest percentage of utility industrial coals now fall into that third category of 1.5-2.5% sulfur. Two and a half parts per million is high.

LOGISTICS OF BLENDING & BARGE & RAIL TRANSPORT

As I see it, the best way for these Illinois Basin coals to fit into the growing export market is by utilizing a blending procedure at port in, or around, the New Orleans area. Lower sulfur coals form the eastern area, that is up the Ohio River, can be loaded by a barge and assembled with barges loading on the lower Ohio or Mississippi Rivers to meet the required sulfur specifications when loaded into vessels at the port. The barges can be transferred intermittently or loaded from storage to ensure the needed quality. Many Illinois Basin coals can be loaded directly on the river, which helps in reducing the costs of transportation. You also have an

excellent railroad system that serves your areas and the ports in the South. In utilizing your railroad system, blending of coals would probably be most effective by combined river movement of lower sulfur coals with the higher sulfur Illinois Basin coal at one of the terminals in the port area. The demand for steam coal overseas will be great in the years ahead. With the capacity that presently exists in this area for producing coal, and with the transportation system that is already available, and with proper coordination and planning, I can see no reason why Illinois Basin coal should not find a more prominent place in the export market. We hear today much about having an energy crisis, and this has been discussed. We in this country don't have an energy crisis. Our country is blessed with an abundance of energy or potential energy. We have an oil crisis. We are dependent upon foreign oil at whatever price it may be. We should make use of our coal resources. This has been talked about today.

In conclusion, I feel that the coal industry can be optimistic about the opportunities to export coal and to attain successful, long-term marketing programs. We have much to gain if we react expeditiously (and that's been talked about also today) to that rapidly developing worldwide coal demand.

Finally, our nation, our state, our industry, must demonstrate to those at home and throughout the world that we have the resources and the capabilities to produce and supply both the needs of the United States and those abroad with our most abundant fuel resource, coal. Thank you.

MR. CASTLE: Bill, thank you. Very much. Our next panelist is Ramesh Malhotra, who is the Assistant Vice President for Marketing at Freeman United.

MR. MALHOTRA: It is a pleasure to be here and to have the opportunity to speak. Just to start off, let's look at what has happened in the Illinois Basin before I get into what mechanism must be developed.

Until recently, Illinois Basin coal was not even recognized in the International market because, for all international communities, U.S. coal was limited to the Appalachian coals. Illinois Basin coal was never considered. It was always Appalachian coal, due to the money issue, until we entered a more costly energy era and all of a sudden the international community started to look for other sources of coal from the United States; then came the Illinois Basin, then Utah and Colorado. So we saw all these coalfields starting to develop.

HIGH SULFUR SITUATION

Now, in the case of the Illinois Basin, the international communities have been looking for coal with the specifications which will "lay it" for Appalachian coal. It does not exist. They're looking for a low sulfur coal but with low vol, too, which does not exist. So there is a problem. Cement industries may be looking for coal (the cement industry in Europe can use high sulfur coal), but people are forgetting the problem of volatile content. But that can be resolved. That's not a big issue. People are beginning to change their minds. Some countries are lowering standards as the quality constraints are changing. Similarly, sulfur contents are changing. It was 1%, 1.5-2%, and is going up. So the problems of

Illinois Basin could be summarized in two ways. One is a short-term view over the next three to four years until the expansion and the internal capacity of the West takes place. During that period, we will see the European communities and the international countries come more and more to Illinois Basin coal, changing their "specs" because of the expected economics of the next thirty years.

LAND ROYALTY RATES

Another factor in relationship to reserves should be brought out. In the East, the royalty rate, is 12-13%, maybe even 15%. In the Midwest most of the royalties are 3%. When you compare the FOB mine price of $25.00 a ton (and 3% of that is the price you are paying for coal) with the East, where you 10% over a 10-year time-frame, there is quite a difference. People are forgetting that aspect. So, there's another element of cost which is not recognized.

COAL WASHING AND UNIFORMITY

Then, coming to utilization involving the level of sulfur in the coal which is "criticized," I think it's a blessing. It's a blessing since, because of high sulfur we have to wash our coal. And when we wash the coal, what do we do? We make a uniform product. When you buy coal out of the East, since they don't have to wash it, the quality jumps all over the place. But in the case of midwestern coals and the washed coals, you get a uniform product. So there's an economic reason for buying Illinois Basin coal.

In conclusion, we will see some growth in Illinois Basin coal which is 2% or under either through blending or direct use. Some coal will move, but in order to achieve a long-term growth in the international communities, for Illinois Basin coal, we have to institute a four-step program.

The first step is awareness. Even though a lot of the international communities have started to switch to Illinois Basin coal to try it because of desperation, they should be made aware of what Illinois Basin coal has to offer. A lot of the points have already been stressed by Bill.

ASSETS OF THE ILLINOIS BASIN

One is the reserves. People who have been buying coal from the Appalachian mines have seen coal seams which pinch-out, thin seams, and thick seams. This instability causes quality changes. They can't be sure of availability and reserves. Also, the properties have not been properly cleared. It is not their fault. It is because they're small operations. However, in the Midwest, when you start mining coal, you start with 6-foot-thick coal. You should go on mining the 6-foot-thick coal and be assured of quality.

Next comes transportation. There are 10 major railroads in the Illinois Basin, and if you take any point in the Illinois Basin and draw an 8-mile radius, you will run into two railroads. When you don't have a railroad, you have competition by truck. Within a 20-mile radius, you could "truck" another railroad. You could barge it. There are six rivers. If you count the six rivers going

throughout, five of them are navigable. People do not recognize the potential of this coalfield.

The other is future availability supply. Everybody, international and domestic, would like to buy low sulfur, high Btu, low ash coal. But, you know, if everybody's mining it, the price goes up. But you watch, and as domestic demand takes off, the price of eastern coal will climb at a much faster rate than the midwestern coal. So, what we are seeing is the price differential becoming bigger because of demand and because of the high costs of production.

Another factor to consider is the quality of coal within the Illinois Basin. If any country plans a long-term utility, it could design its boilers--one after another--with a standard specification. You can count on the coal; the quality will not be changing. In the East, a seam may be mined out, and if you want to open a new unit, you have to start all over again. That's another positive thing which is not being recognized. So, basically what I'm saying is that Illinois Basin coal with the exception of sulfur content, has all positive factors. Now, to return to awareness, I am saying we should bring to the international community an awareness of what the Illinois Basin can do, explain its positive value.

SELLING ILLINOIS COAL

My second point is acceptability. We have got to get this coal accepted in the international community. One way is to bring it to the attention of the international community that Illinois Basin coal has been mined since 1830 or earlier. And it has a good burning record. We have not had a big power blowup or anything like that. We have not had one Simmon plant go in the air because of Illinois Number 6 coal or Number 5 coal. So, we should transfer that expediency to the European community and others so that they can design their equipment for the longer term, a forty-year time span.

PERFORMANCE OF ILLINOIS COAL

To do this, we should also show them our history which illustrates the outstanding performance Illinois Basin coal has given its customers. We will talk to Union Electric. We will talk to all the customers who have wanted Illinois coal and we will show to them that this coal performs. We should also show them price stability. The price of Illinois Basin coal has nothing like a yo-yo or an up-and-down, effect. The price has been more or less stable. It's another positive factor because you are not playing the "roller coaster" game. Another factor is competition. Because of its location between the Appalachian coal field and the western coal field, Illinois Basin coal producers cannot ask for high prices. If the Appalachian coal sets the price pattern in the United States, we are the followers, or we get the leftovers. You will get the lowest price because if Illinois Basin prices go higher than Appalachian coal, Appalachian coal will take over the market because of the Btu content. We must talk with various countries and show them that this fear of the unknown, as I said earlier, is exactly that. We have got to get this fear out of the way. We must sell Illinois Basin coal using expediency. We should get people who have burned the coal and get them together with people who will consider burning

our coal. I am also suggesting that we have some plant visits, invite some of the international people to visit our plants--power plants, cement plants. Show them that this coal can be used. Show them coal blending can be done, and is being done. Show them our new technology. We should try to transfer some of these new technologies we are discovering to the other countries and work with them because, basically, we are all in this together.

DEPENDABILITY OF ILLINOIS COAL

Still another major factor is dependability. We have to prove to the international community that Illinois coal is a dependable source of supply. To do that, we should demonstrate and prove that we can reduce work stoppages--reduce the labor problem--and also that we can improve productivity. If you can assure that, that would be a very positive factor. For further dependability, we must integrate our transportation network. So far, our transportation network is designed to serve the domestic market. It has never handled the international business. So we have to look all over our transportation network from an international point of view. We must expand and modernize our handling facilities which are designed for local use. We must understand the ocean vessel business. Half of the transportation departments of the coal companies don't know what vessel rates are all about. We have to get to know these things before we get into this business. Also, we have to understand the thinking mechanisms of the international community because in the United States, when we deal in the same language, with the same people, it is much easier to do business. When we are dealing with the French or the Spanish, for example, there is a communication barrier; there is a cultural barrier. We have to understand the culture we are dealing with as partners. This is very critical for dependability to be proven.

RELIABILITY OF ILLINOIS BASIN COAL

We come to reliability. We have to prove to the international community that not only do we have the reserves, but also that we are dependable. We have to upgrade our coal analysis system. We have been using a rapid short-term process analysis down at the mines. We may have to incorporate that into the international system. What happens to that coal which is loaded from the mines, goes to New Orleans, is loaded on the ship, and goes all the way to Spain or to Japan? We have to agree where the quality is determined and who's responsible so that they can rely on what they bought.

CONTRACTUAL PHILOSOPHY

Another factor to modify is our contracting philosophy. We are dealing with international business. We have got to change our thinking because in this country we are used to 25 to 30-year contracts. We would not be competing among ourselves locally but with Appalachian coal and with Utah coal. We would be competing with Polish coal, and with Australian coal, and with South African coal. The market would be different. Contracting to the market would be different. They want to consider long term. We have to consider that part. We must also establish our overseas sales representa-

tives. Because of time differences, problems and issues, we have got to have somebody there who can listen to and understand the problems of the customer.

We must also develop an integrated mine-to-market program. A lot of the international customers like the CCIF prices because we control some elements and they control some elements. So if we could integrate from the mine to the market, that would be another way of proving to customers that we are reliable sources of supply.

So, in summary, what I'm saying is that we have got a 40-year time span until the eastern problem of money is resolved. If we work hard on these four issues, I can assure you Illinois Basin coal will have a very good market. If we don't do it, forget it! There will be no market.

MR. CASTLE: Thank you very much. Our next speaker and panelist is Frank Beal, who is Director of Illinois Institute of Natural Resources.

MR. BEAL: Thank you, John. There are three guys in the back of the room who are taking side bets on whether I will be able to say anything original or not. And I think you can start collecting now if you would like. The reason I say this is that it's very hard to be at the end of this panel, with your rather thorough, and, I think, sophisticated, analysis of the issue; if I weren't in government, I would invest in Freeman United stock. Your enthusiasm for marketing Illinois coal is greatly appreciated and your insights into it I thought were very striking.

COOPERATION BETWEEN GOVERNMENT AND BUSINESS

I would just like briefly to address myself to what I see as two dilemmas that face us who are concerned with marketing Illinois coal, two of my own personal biases, or prejudices, and a commitment. Of the dilemmas that I see, the first one is the dilemma of the public and the private interest here. I think it's interesting that of the six of us here, four of use are public officials and two are private sector people. Sometimes those of us from the public sector overwhelm those of the private sector with our desire to help you. Maybe we would be better off if the ratio would reverse and we'd listen to you more rather than tell you about how we're going to help you. I think it's going to have to be a very careful balance between those of you who own, mine, transport, induce use, and buy the coal, and those of us in the government who can either frustrate your efforts or aid your efforts. Sometimes you have an unwillingness to be as clear as you should be when telling us when we are frustrating you and when we are really helping you. So, I think that's something that we have to keep in mind as we look ahead to the opportunities for marketing Illinois Basin coal.

NATIONAL VS. REGIONAL INTERESTS

The other dilemma is national versus regional interest, which is very, very real, and, I think, gets glossed over too easily. The national interest in exporting coal may or may not coincide with Illinois Basin interests. There has been a wide division here about what is good for us versus what is good for the nation as a whole. It's perfectly well and good for the U.S. Department of Commerce and

the U.S. Department of Energy to give testimony as to their commitment to coal, but if that is not translated into action that helps Illinois Basin coal, it means nothing to us. This means, particularly, that the States of Kentucky and Indiana and Illinois, will have to be more vigilant in their watch for oversights in congressional and administrative action as they affect the export of Illinois Basin coal. I think we cannot ignore this as we look at the booming market in coal exports.

PROMOTING COAL TECHNOLOGY

In terms of my prejudices, I think first of all, that we should be marketing technologies for coal use. The decision to use coal was made very early. People designed technologies to use coal and then looked for the coal rather than the other way around, or rather it's a simultaneous process more accurately. We are foolish unless we do advance homework to find out who is ready to make a commitment and try to convince them to use technology that can use our kind of coal. If you can convince them to use the technologies to use our coal, the coal sale is going to come. It doesn't happen the other way around.

RESEARCH AND THE SULFUR PROBLEM

My second bias is to continue to accelerate our efforts in the area of research on the problem of sulfur. Since this is a uniquely midwestern problem, not a nationwide problem, we are not going to see as much leadership from the federal government as we would like. We are going to have to do it ourselves. We are going to have to make the commitment to deal with the problem of the high sulfur in these coals. We heard this morning time and time again, from those who have tried to market the coal, that high sulfur is clearly a handicap. I note that this great nation--a hundred years ago, two hundred years ago--invested substantial sums of money in agricultural research. They saw the rich soil of the prairies and they said in order to maximize the return we have to create a research capacity and an educational capacity and an extension service capacity, and they have done that in the universities in this state and in our neighboring states. We need that same kind of commitment to aggressive research programs with respect to coal because that's the resources that's here. It could contribute greatly to our economy, but to do that, we have to make a public investment of the kind that has not yet been forthcoming.

And finally, with respect to commitment, and despite what I have said about the public sector and its sometimes confusion in efforts to help, as a government agency, we are prepared to go all out both for the supplier, the seller of the coal and the buyers of the coal. We are committed. We want to make it happen. We need the help of the private sector, and with that help I think we can make some substantial progress.

GOVERNMENT OFFICES OVERSEAS

MR. CASTLE: Thank you very much, Frank, and on that last point, I would like to assure Ramesh and other producers' representatives in the room, that the state does maintain three overseas

offices in South America, Europe, and Southeast Asia. We would be more than happy to help you with that representation you're looking for. I think it's extremely important. I'd like to exercise my perogative as Moderator and ask a question before opening it to questions in general.

COAL BLENDING

Throughout the Conference today, I have been struck by one theme which has recurred, and that's the theme of blending, selling Illinois coal through blending. What mechanism exists now for bringing together various kinds of coal for blending? I would assume there are private deals between coal companies or within a single company. What mechanism might be established, in the future, to promote blending and encourage it, to make it more feasible than it apparently has been in the past. I ask any one of you, or all of you, to address that question.

MR. MASON: I don't know how you would work together on a deal like this, but I think it's going to be the seller who makes the proposal or makes the sale to the overseas customer who has to be responsible for the product.

BLENDING AT THE PORT

As Mr. Malhotra pointed out, I think it is one of the things that a seller must do. He has to stand behind his product. And if he does sell a blend, he sells a blend at the port. And if you are going to blend, as he suggested, at the port of New Orleans, or at one of the ports in that particular area, you can either have low sulfur or the high sulfur (there are two different opinions as to what you should have) in dock at New Orleans. I am of the opinion you probably should have low sulfur in storage and blend up, you might say, but you could have the high sulfur there and blend down.

PROBLEMS OF BLENDING

There are certain problems that I think you ultimately are going to confront in this blending business for overseas, and I think we ought to face that. There are other characteristics in the state of the art other than sulfur, ash, and volatile matter. If you could make a product that meets the volatile standards (it is being used now by the cement people and some of the utilities), you would still run into other problems. There are certain chemical characteristics in sodium, potassium, chlorine, and other items that may present problems for blending projects. This problem is going to have to be addressed because the Spanish and the French are very sophisticated. They know what they're buying. I don't think we have a problem with the French buying Illinois coal. They know what they are buying. They have specifications. They are one of the largest buyers of American coal, particularly steam coal. The Spanish are also becoming a real factor in the picture. In blending, there will be problems, but I am optimistic. I think it can be done and I think it's one way of achieving a market for high sulfur coals in the world market today. But I think you should be aware of some of the pitfalls.

MR. MALHOTRA: I would like to make a comment on blending. With most of Illinois coal you are looking at a high sulfur coal or medium-to-low sulfur coal high in chlorine. In the United States and England, it has been recognized that high chlorine also causes problems. One of the other side effects of blending with eastern coal is that you lose chlorine content. Blending will not only help you to reduce sulfur, but it will also have the side effect of raising the Btu to lower the chlorine content so you can have a manufactured product that you can control. But the problem that comes up is that it is not an actual blending. It is a mixing. And there is a difference. If the mixing is not done properly, your customer is not going to be very happy. Blending requires setting up a very proper and very sophisticated blending system. You may have to set up a very good blending system not only for U.S. coals, but also for French, Spanish, Australian and all other coals. And when you take and make a "meatloaf" out of it, you don't know what the total reaction will be. The positive and negative aspects must be examined very carefully. But blending is an interim solution in my mind. The long-term solution would be acceptable technology.

MR. CASTLE: Art, do you have anything?

MR. NICHOLSON: I feel compelled to say something. I am a bit skeptical. My reasoning is that in many cases in West Virginia and eastern Kentucky, where an operator is mining low sulfur coal, he is also mining a seam of high sulfur coal. West Virginia and eastern Kentucky have coal with 3% sulfur. So, the blending that is going on (and I anticipate the short term) would be that kind of thing. This might be a ready solution to your problem, although, certainly, Ramesh is a better judge of that than I am.

MR. CASTLE: Thank you very much, Art. We have about 15 minutes left. I would like to open this to questions from the floor. If you have questions, please come to the microphone. Yes, sir.

SPEAKER FROM THE AUDIENCE: I would like to compliment Mr. Malhotra on his expert knowledge of the industry, and I can particularly appreciate the way it is viewed from abroad. The increasing emphasis is on detailed knowledge and detailed specifications for coal.

FUSION TEMPERATURE FOR ILLINOIS BASIN COAL

I would like him to address himself for a moment to the question of the fusion temperature of coal because I understand that considerable portions of the Illinois Basin coal have a fusion temperature below 1400 degrees centigrade, which is current both in cement fuels and in modern pulverized fuel electricity generating plants.

MR. MALHOTRA: That is a quality constraint which you have imposed upon your imports. It is really designed for eastern coals. And I agree that we have a temperature problem for the cement industries and others, but (and you may be hearing it very shortly) one company, Freeman United, has designed a contract with a Spanish firm for cement use. There will be no blending; it will be all Illinois coal. And the specifications were for low volatile, low fusion

coal, but we had to convince them (we had to go a long way to convince them) that this would work. I will say for precaution's sake (because some of the specifications laid out for buyers in the cement industry in Europe are designed for equipment which was German or some other equipment) that the specifications that were laid out were based on Polish and other coals. The specifications have not really been examined. It remains a question of a test shipment. We are also looking over cases in the utilities where the fusion temperature is concerned. We are finding out that for ASTM standards you have a range of 70° up and down that is allowable. We are meeting ASTM standards, 70° up and down, which makes a hell of a difference. In those cases, you may want to look at the T-50 approach because that is the most antiquated. We may have to work together to resolve the issues. We can't change Mother Nature, but we can work together to solve the problem.

MR. CASTLE: Thank you very much; we have a question on my right.

SPEAKER FROM THE AUDIENCE: Yes, this is in response. My name is Hyden, from the University of Illinois in Chicago.

NATIONAL AND REGIONAL GOALS

I have a question that relates to what Director Beal and Senator Buzbee brought up, namely the conflict between national goals and regional objectives. Unfortunately, at the international level, we can't provide a specification advantage to Illinois coal as we have done under the Clean Air Act Amendments. Under the Clean Air Act Amendments we required that all coal be scrubbed. You can't make an argument to scrub western coal on the basis of health considerations; you can't make an argument to scrub western coal on the basis of economic considerations. It is a political issue to try to give eastern coal regions some competitive edge in dealing with western coal. Now, while we are looking at export markets, there is a high probability that that advantage will be lost. If that happens, first, what is being done to try to maintain the advantage? And two, what contingency plans do state and industry have if, indeed, the requirement of scrubbing all coal is eliminated?

MR. CASTLE: Senator Buzbee?

SENATOR BUZBEE: We have to create a market for what we have and we have to have some edge, and that will only come about through research. One of my favorites is the Chemical Coal Cleaning Process as it is being generated by the manufacturer, Allis-Chalmers. It is on-line, going on-line here, in about a year and a half at Wood River. The Kilngas process, the fluidized bed process (these sorts of things), are also potential answers, or part of the answer.

I have been meaning to tell you today, regarding the cutting of chemical coal cleaning research dollars at the federal levels, the magnificent sum of 1.2 million dollars is being given by the federal government in Fiscal Year 81 for chemical coal cleaning research. In FY 82 that magnificent sum is going to be reduced to $800,000. And in FY 83 it is zeroed out. Some technologies that have been being looked at for a long time (the MHD technology and so forth)

are zeroed out in FY 83. We are saving pennies today which, perhaps, would make us multi-millions of dollars tomorrow.

We do, however, have an advantage in the Midwest that they do not have in the East. We have transportation facilities. Mr. Malhotra pointed out that in the coalfields here you can find two railroads in an 8-mile radius; you can find six rivers and an interstate highway system that will let us truck stuff anywhere we want to truck it. We can get it to a port in New Orleans. We can get it out. We can do it cheaper than you can by paying 3, 4, and 5 weeks to move it. All of this is an advantage. It should be a part of the national energy policy to us in the Illinois Basin--coal as part of our total energy policy. Yes, it is self-serving for us, but--it is also good for the economy. We will get to pay more income taxes to the federal government. In the State of Illinois we now get 71 cents back for each dollar we put in and with the budget emphasis on increased defense spending, it is going to go down even more dramatically. It would be good for us in this part of the country to increase our ability to pay more federal income taxes. We do that through increased profits and through increased hours worked by the coal mines.

MR. CASTLE: Thanks, Senator. Frank, would you like to comment?

MR. BEAL: I would like to address one part of our question, which is, when is the state going to look out for its interests? The Governor's office and the Illinois EPA are monitoring the progress of the hearings in Washington on the Clean Air Act and I know Senator Buzbee and U.S. Congressmen Cochoran and eight other state and federal legislators have just formed a committee of legislators interested in a wide variety of energy issues including the Clean Air Act and energy questions. So I think there are many people watching, but, you are quite right, the Amendment to the Clean Air act could, in fact, have a serious mid- and long-term effect on the marketability of Illinois coal.

MR. CASTLE: Thank you very much. We have another question.

HIGH COST OF TECHNOLOGY

SPEAKER FROM THE AUDIENCE: It is not as much a question as a comment. I'm Ray Long of IEA Coal Research. I am sorry to return to my earlier note of pessimism, but a number of technologies have been mentioned here as possible saviors for high sulfur coal. What I would like to point out is that we are talking about things which at the moment are weakening Illinois coal research and are pretty high-class things. Let me give you some very rough figures here as we see them. If you take, for example, pressure, pulverized gas, and then look at the cost of pulverized gas plus cleaning, fluidized bed combustion, pressurized bed and employment gas combined cycle (just running down the four technologies), first of all, the capital costs are in millions of dollars. This is considering a thousand megawatt plants, we saw 510 million dollars for a pulverized bed plant and 30 million dollars for that, plus cleaning. Fifty million dollars are for fluidized bed combustion. Six hundred fifty million dollars are for pulverized fuel plus FGD. Six hundred million dollars are for gas-combined cycles. Now, if we consider the operating costs, (and that is our kilowatt hour), we have 32 for

pulverized fuel, 37 for pulverized fuel plus cleaning, 34 for fluidized plant combustion, 38 for pulverized fuel plus FGD, and 33 for the gas-combined cycle.

These are extremely rough estimates, but the question I would like to ask is, can those high costs be absorbed within the economy without undermining the income generating processes of economic growth themselves or can we move to a situation where we can actually get those capital costs down?

MR. CASTLE: Who would like to comment? Frank, let's start with you.

MR. BEAL: I don't know. There is no question that if you go to more sophisticated technologies and more sophisticated practices, you're going to add to the costs, but it is foolish to think that we are going to turn back national and international commitments to a more reasonable quality for the environment. It will not happen. And those who pin their hopes on going back to the days when we couldn't see pit-burning are just wrong. That won't happen. Therefore, we are going to come up with the technology that will allow us both to use the resources that we have available, and, perhaps, pay the high premium in order to use it. I can't address the specific technology you mentioned or the relative cost differences. I do acknowledge that they're more expensive. There is no doubt about it.

MR. CASTLE: I'm not sure either. What are you feeling?

MR. MALHOTRA: It is pretty hard to really look at the economics when you are selling coal today. You have enough trouble now competing with the Australian and South African companies. We can't compete. There is no question about it. But I think we get confused on this issue of short-term and long-term, and we are long-term; when you look at the technology, we are looking at the long-term issue. Technology will go on, but I think what we are looking at is that we have to get started. A lot of research is being done in other countries, too. But let's concentrate on the short term now, because you're not going to sell if you can't find your market today. We have to think of today first. We have to get the acceptable product now. We will work on getting the other issues, but we have to work together to accept it as it is.

MR. CASTLE: I agree with a lot of what has been said on that, and I might just mention a thought. I spent a number of years when we were looking at various technologies and working on our own central program in Kentucky and looking at these technologies. The problem is you have to make assumptions about what the future energy choices are going to be and what costs are going to be and, in most cases, you are working with engineering data, and my experience has been that individual enthusiasm sometimes causes you to look at them a little optimistically. Nevertheless, I think we feel that many of the technologies that we now have will be competitive when they are on-line. However, they won't serve all purposes. So, we are very anxious, as Ramesh described, very anxious to get on with the direct use of coal--with some application, largely for electrical generation and so on. I did leave out one little shot at Senator Ken Buzbee (now that he is gone) in the business of stealing the synfuel plant; Texas Eastern wanted us to cooperate, and we did cooperate, with Illinois for a long time, and we were quite willing to build a

plant in Kentucky, and we don't mind if they buy a little coal from us. Thank you.

MR. MALHOTRA: I would like to make a comment too. He always likes friendly competition. But he definitely likes to be back here.

MR. CASTLE: There is a little competition among all of us. It is 5 o'clock. It is time to end this session. I just want to thank the panel members for a very interesting panel and to thank all of you for your participation.

CONFERENCE PAPERS

U.S. COAL EXPORT PROSPECTS: SOME GLOBAL PERSPECTIVES

Ray Long

It's always useful in any discussion of international trade to remember that net exports or imports are the relatively small balancing item between two large quantities of supply and demand at the national or regional level. This makes for difficulty in forecasting and in keeping abreast of rapidly changing opportunities. The U.S. coal exporting situation is a case in point. As late as 1979, the DOE's Report to Congress listed exports not much more than 100 million tons by the end of the century. Now, largely as a result of the World Coal Study--itself a major effort in international collaborative research--a possible level of 350-400 MT is indicated. And analyses of potential suggest long-run figures even higher.

This late development of awareness may reflect the fact that countries inevitably tend to look at their external trading opportunities from the inside out, as it were. I detect a feeling in the U.S. now that the potential for a rapid expansion of the coal mining industry is there, but some demonstration of commitment to greater coal use is required on the part of the major importing countries. The importing countries, on their side, are somewhat wary of long-term reliance on imported coal for their incremental energy needs until ensured availability has been demonstrated. There is a danger here of the opportunities falling between two stools--of not getting enough done to generate the level of world coal trade suggested by global energy requirements over the balance of this century.

IEA COAL RESEARCH

The work of IEA Coal Research, and the particular section of it for which I work, provides some global analysis of these issues, and I would like to start by saying something about my organization's work which is relevant to this presentation. IEA Coal Research was set up in London in 1976 shortly after the International Energy Agency was established in Paris. Its purpose is to look specifically at ways in which a greater use of coal can be promoted to replace imports of oil and gas in the major industrialized countries over the medium to long term. The organization now comprises four services: 1) a Technical Information Service; 2) a World Coal Reserves and Resources Data Bank; 3) a Mining Technology Clearing House; and 4) the Economic Assessment Service (EAS). The EAS is currently funded by 12 member-countries of the IEA, including of course the U.S.

The EAS has concentrated its main effort to date on analyzing costs of new coal-using technologies in more efficient coal-burning for power generation; in gasification; and in liquefaction. In addition, the Service has done work on the economics of coal use in residential and industrial markets, and on the costs of environmental control in coal use. Finally, there is a section--in which I work--called "Supply, Transport, and Trade," which is looking at the economics of the entire coal chain from mine production, through the

land and sea transport of coal, to consumption and delivered prices in the market.

My job in this has two aspects. One aspect has been to develop a framework of thinking about global energy demand and supply, cost and price, which clearly have an impact on the more specific analyses of coal economics which EAS is carrying out. This is being pursued by developing a regionally disaggregated global energy model called EDSAFF (Energy Demand/Supply Analysis and Forecasting Framework). This work is still in its formative stage, and some of the numbers I will be putting up later are still subject to reconsideration as the development of the model continues.

The other aspect has been to look specifically at constraints on internationally traded coal. Some forecasts have come out of my work on global energy demand and supply which are at the higher end of the range of forecasts in the World Coal Study referred to earlier. I am now in the process of examining possible physical and institutional constraints which could prevent these high levels of trade from being attained. So far, this work has concentrated on the cost and availability of coal by sulfur and Btu categories from major exporting countries. This is particularly relevant to the discussions at this conference, so I want to concentrate my remarks on future levels of international trade; on the role of coals of varying sulfur categories in this; and on the position of U.S. coal suppliers with some reference to Illinois coal and midwestern coal in general.

WORLD ENERGY AND COAL FLOWS

The key factors influencing the level of international coal trade are presented in the first chart. I'll say more about item 3--costs and prices--later. Table 1 summarizes the conclusions I've reached about points 1, 2, and 4. The main points are a rapid rate of economic growth in the 1990's after the subdued growth of the 1970's continue into the 1980's; some improvement in energy dependence compared with what it has been historically (about 1:1 up to the late 1970's; a rapid expansion of nuclear power; and sustained increases in hydropower, gas, and coal. A lower rate of increase in world output or greater energy dependence would detract from coal demand. On the other hand, perhaps the more likely shortfall of nuclear power below the high growth rates envisaged would increase the importance of coal as the marginal energy supplier.

International trade is determined precisely by the imbalance, at the country or regional level, in the energy demand and supply in question. Table 2 shows a relatively large net importing potential on the part of the developing countries and an absolutely large importing potential on the part of the developed countries. The production forecasts for western countries are based on detailed analyses of reserves and potential. I have then assumed that communist countries could make up the balance of supply required to meet demand.

That last assumption raises a host of questions regarding the technical feasibility of exploiting remote reserves, capital and technological transfers between the non-communist and communist world, and East-West geopolitical relations in general. But the fact is that between the Soviet Union and China, there are large reserves (209 out of 663 billion tons of recoverable reserves in the world according to latest World Energy Conference data), and it makes no sense to talk about a high coal-demand scenario without the

vast reserves of the communist countries being brought into the world trade picture in some way. The point to make here is that if communist countries do not become significant net exporters of energy, even greater pressure for expansion is put on western coal producers.

Table 3 shows coal trade by major exporters and importers. Points to note here on the importing side are the rapid rise of West European and Japanese imports, but also the relatively large increase in coal imports to Southeast Asia, particularly in the 1990's and, to a lesser degree, South America. On the exporting side, the export potential of the four major non-communist exporting countries is particularly interesting when seen relative to their domestic demand (Table 4). Exports from Australia account for 48% of total production, and from Canada and South Africa for 35-40%. In the case of the U.S., however, the proportion of production accounted for by exports, while rising from its current level of 7-8%, is still only 14%.

Despite having reserves large enough to expand production well beyond the levels indicated, there are signs in Australia, Canada, and South Africa that limitations could be imposed on exports for reasons to do with long-term national interest, balanced regional development, and availability of manpower. The implication is that the U.S. with less pressure of competing demands between the export and domestic markets, would have greater flexibility in meeting export opportunities.

QUALITY, COSTS, AND REGIONAL POTENTIAL

This leads us straight into the question of importer preferences, quality, and costs. The fact is that currently, major importers are tending to favor non-U.S. coals, partly perhaps because they don't want to replace dependence on Middle East oil with a comparable dependence on U.S. coal, but more specifically because Australian, Canadian, and South African coals for export are entirely low sulfur and can be delivered at a price--in the case of Australia and South Africa certainly--that is less than U.S. delivered prices even where long sea journeys are involved.

An indication of production relative to capacity and cost at the levels of demand indicated earlier is given in Table 5. These numbers summarize the regionally disaggregated work I've recently done on coal availability by quality for the countries mentioned. They are subject to two major qualifications: first, the capacity figures relate only to capacity as currently documented; long-run capacity in all four countries is certainly much greater. Second, the cost numbers relate to 1981 costs and do not take into account future real increases in capital and labor costs.

Given these qualifications, at the levels of demand indicated earlier, it seems unlikely that total demand for U.S. coal, domestic and exports, at the end of the century can be met entirely from low and medium bituminous coal production; some of the demand will have to be met from a mixture of subbituminous low sulfur coal (LSC) from the West and bituminous high sulfur coal (HSC) from the East and Midwest. The two extremes of maximum western LSC and maximum HSC are indicated at the bottom of Table 5. The point is that U.S. production costs, already at a disadvantage relative to other exporters, tend to increase with the greater use of HSC as the balancing supply compared with western LSC, though these numbers

take no account of the different costs involved in getting coal from mine to domestic markets or exporting port.

THE LONG-TERM ACCEPTABILITY OF HSC

Such as it is, this scenario is not very promising for HSC from the Illinois Basin in the short-to-medium-term. U.S. coal is generally high-cost compared with other potential suppliers to the export market. This is not to say that the U.S. will be priced out of the market for low sulfur coal. Given a policy on the part of the major importers to diversify sources as much as possible, the international coal market should operate like any market conforming to theoretical demand/supply relationships. Prices will be set by the highest-cost producer whose output is required to clear the market. What this does mean, though, is that importers will prefer only high sulfur coal if there is a substantial difference in price which offsets the costs of desulfurizing it. This does not seem to be a possibility in the near-to-medium-term, given the amounts of exportable coal from Australia, South Africa, and Canada which are entirely low sulfur and relatively low cost, even at higher levels of demand than indicated earlier.

We need to look, therefore, at the possibility of high sulfur coal beginning to be in high demand over the medium-to-long-term with the commercialization of new technologies which solve the environmental problems associated with its use. These technologies include beneficiation and scrubbing, fluidized bed combustion, gasification, and liquefaction. At this point it is appropriate to review EAS' own work. As I said earlier a major part of EAS work has been on coal conversion technologies. Broad cost estimates have been derived for new technologies in power generation, gasification, and liquefaction, and the main thrust of recent work has been reviewing the detailed economics of different gasification processes and indirect liquefaction methods.

Another area of work which looks specifically at the problems of sulfur control has produced cost estimates for a range of desulfurization technologies in the pre-combustion, combustion, and post-combustion stages of coal utilization. Without going into the details of this work, I'll try to summarize some conclusions that are being reached against the background of the macro-energy analysis which I presented earlier. While medium sulfur coals may be amenable to the less costly beneficiation and FGD systems, the widespread use of high sulfur coal awaits the commercialization of large-scale FBC and gasification/combined cycle in power generation; substitute natural gas; and liquefaction. The time-scale of the first two may be within this decade, though there is some question about how widespread their implementation might be.

A greater demand for HSC may await the 1990's and the early years of the next century when, under the pressure of high energy requirements, conventional sources of oil may begin to run out. Then, the very high costs of unconventional sources of naturally occurring liquids, including enhanced recovery from conventional sources, will provide a greater possibility of economic coal liquefaction. The point has been made by the International Institute of Applied Systems Analysis, in a recent study looking well into the 21st Century, that within the next 50 years, coal could become too valuable as a source of liquids to be used in its conventional applications, including power generation which would then be

increasingly accounted for by nuclear, solar, and possibly other renewable technologies.

ECONOMIC GROWTH ASSUMPTIONS

The question that scenario gives rise to is whether the implied high costs of energy could be absorbed into the income-generating processes of economic growth without undermining growth itself. This brings us right back to the central importance of economic growth assumptions in any forecasting exercise. One reaction to the forecasts presented earlier is to ask why they are more likely than others which are less bullish about economic growth and energy demand in the long term.

The answer is that it is oversimple to look on forecasting just as an exercise in the positive economics of predicting what will happen in the future. Forecasts need to contain a large element of normative economics because they are an expensive luxury unless policy formulation or management decisions are influenced somewhere along the line. Forecasting, therefore, has to be a three-stage process of identifying what could happen; what ought to happen to meet defined political or profit-oriented objectives; and what has to change to make the goal become the reality.

The high growth and associated energy demand forecasts reflect a world economy moving successfully, if slowly, out of the doldrums of the past few years toward recovery in the second half of the 1980's and renewed vigor in the 1990's--something applauded by all, presumably apart from the champions of nil growth. The forecasts may look too optimistic, but they are attainable if governments and businesses have the will to make them so. This is a principle, I suggest, which applies not only to the broad macro-energy developments which I have been describing, but also to the more local concerns about the future for Illinois coal which you are addressing at this conference. The market may not look good in the short term, but in the long term, energy--even coal--may be too scarce a commodity for consumers to be choosy about its qualities.

APPENDIX A

CHART 1

FACTORS INFLUENCING THE LEVEL
OF INTERNATIONAL COAL TRADE

1. economic growth and its geographic occurrence;

2. energy dependence, defined as the rate of increase in energy demand relative to economic growth;

3. relative costs and prices of energy by type; and

4. energy substitution.

TABLE 1

ECONOMIC ACTIVITY AND ENERGY DEMAND
(annual % increase)

	1973-77	1977-90	1990-2000	1977-2000
World gross product	+ 2.6	+ 2.5	+ 4.8	+ 3.5
World primary energy demand	+ 2.5	+ 2.2	+ 3.8	+ 2.9
Primary energy sources:				
Coal	+ 2.9	+ 3.8	+ 4.5	+ 4.1
Oil	+ 1.7	+ 0.5	+ 0.7	+ 0.6
Gas	+ 2.1	+ 2.0	+ 5.8	+ 3.7
Nuclear	+26.6	+ 7.9	+12.2	+ 9.7
Hydro	+ 3.7	+ 5.8	+ 5.3	+ 5.6
Non-Commercial	---	- 0.5	- 4.9	- 2.4
Energy dependence	0.97	0.88	0.79	0.83

TABLE 2

REGIONAL COAL REQUIREMENTS AND PRODUCTION
(million tons of coal equivalent)

	1977		1990		2000	
	Req.	Prod.	Req.	Prod.	Req.	Prod.
Developed countries	1157	1125	2547	2515	4328	4158
Oil producers	10	8	15	5	20	9
Other LDC's	135	128	153	143	446	209
Communist countries	1476	1518	1812	1864	2213	2631
World	2778	2778	4527	4527	7007	7007

TABLE 3

REGIONAL COAL TRADE
(million tons of coal equivalent)

	Exporters			Importers	
	1977	2000		1977	2000
Australia	39	195	Western Europe	77	709
Canada	12	100	Japan	62	219
South Africa	11	100	S.E. Asia	3	225
U.S.	49	367	Latin America	6	46
Communist	73	457	Communist	34	39
Other	18	54	Other	21	35
Total	203	1273		203	35

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TABLE 4

COAL DEMAND FOR MAJOR EXPORTERS IN 2000
(million tons of coal equivalent)

	Domestic	Exports	Total
Australia	215	195	410
Canada	188	100	288
South Africa	159	100	259
U.S.	2264	367	2631

TABLE 5

PRODUCTION CAPACITY AND COSTS OF MAJOR EXPORTERS

Costs	Production in 2000 (MTCE)	Percentage of Identified Capacity	1981 In $ Per Ton
Australia	410	34%	25
Canada	288	66%	25
South Africa	259	44%	17
U.S. (a)	2631	79%	39
(b)	2631	98%	49

(a) maximum production of bituminous LSC and MSC with balance from western subbituminous LSC

(b) maximum production of bituminous LSC and MSC with balance from midwestern and eastern HSC

NOTES

[1]The views expressed in this paper are those of the author; they reflect the economic assessment work going on in IEA Coal Research, but are not necessarily the views of the organization or of supporting countries.

THE PROSPECTS OF COAL AND HIGH SULFUR COAL

Bernard F. Grossling

First of all, I must thank Senator Charles H. Percy for his invitation to participate in this conference, which has given me an opportunity to learn of the export prospects of high sulfur coal. Also, I am grateful to the Inter-American Development Bank for making this participation feasible. My own brief reflections on this issue--in terms of the energy position of one particular marketing area, namely Latin America--might contribute to an understanding of the strengths and challenges of coal.

The marketing opportunities for high sulfur coal, such as some of the Illinois coal, has to be surveyed within a broad framework of issues. The energy scenario which opened up in 1973 unveiled what is now known as the energy crisis. It brought a tightening of the supply/demand conditions for oil, gas, coal, and nuclear energy, which the main energy resources of today's economies. And it has become apparent that one of the main challenges is how to bridge a 30-to-50-year gap produced by the dwindling oil supplies. Beyond, one may foresee again an eased energy situation based mainly on solar energy, energy from bio mass, and fusion.

WORLDWIDE COAL PRODUCTION

World production of anthracite and bituminous coal has expanded continuously; for instance, it has doubled in the last 30 years. However, this fact is not apparent if one merely considers the relative contribution of coal to the total energy, since it has continuously yielded to oil and gas. The major coal producers (with their approximate annual productions) are: United States (600 million tons), U.S.S.R. (500 million tons), People's Republic of China (490 million tons), Poland (186 million tons), United Kingdom (120 million tons), India (99 million tons), and South Africa (85 million tons). The United States, the U.S.S.R., the People's Republic of China, and Western Europe account for about 84% of the world's hard coal production. By comparison, Latin America accounts only for .44% The developing countries account for about 31% of the world's hard coal production, whereas they account for about 60% of its oil, and 22% of its gas.

Currently only about 8.1% of the world's hard coal production enters into international trade, whereas about 40% of crude oil enters into it. The coal import picture is dominated by a few countries: Japan (61 million tons); France (22 million tons); and Italy (12 million tons). By comparison, Brazil imports only 3.5 million tons. The major users of coal are the utilities (about 65%), and the coke plants (about 17%). It is not yet clear whether a larger fraction of coal will enter into international trade in the future. The overwhelming part of the coal in international trade consists of metallurgical coal which needs to be low in sulfur. The pattern of production and trade has to be contrasted with that of the distribution of the coal reserves. The U.S.S.R. is estimated to have about 40% of world coal geological resources, the United States 25%, and China 14%.

There are more oil than coal resources. How much oil greatly depends on whom is asked. The world geological resources of hard coal are estimated at 7.7 x 1012 tce (ton of coal equivalent), and

lignite at 2.4 x 1012 tce. The upper figure for oil corresponds to my own upper estimates. To grasp the magnitude of the geological coal resources, it can be said that, with a 50% recovery and a 3% annual growth rate of production, they would be used up in about 140 years.

COAL IN LATIN AMERICA

The known coal deposits of Latin America are rather small, and of quite variable characteristics. They range in sulfur content from low to high. Annual production of bituminous coal and anthracite amount to about 10 million tons per year (Colombia, 4 million; Brazil, 3 million; Mexico, 2.4 million). Unless substantial new coal discoveries are made, only Colombia could be a significant coal exporter.

From the above considerations, the following main points emerge. The prospects of a much-enhanced coal production within the next ten years or so may become constrained, aside from other factors, by oil findings larger than what are now foreseen by conventional wisdom. The prospects of a larger participation of coal in the international trade hinges on enhanced larger exports of U.S. coal. Coal, such as steam coal, would be needed in increasing amounts by Western Europe, Japan, and some developing countries. Although the short-term prospects for enhanced U.S. coal exports may appear impaired by competition from other exporters (Poland, South Africa, Canada), none of these has the coal resources for a large-scale contribution.

IMPORTATION REQUIREMENTS ABROAD

Specifically, as to the export of high sulfur coal, the importing countries would be influenced greatly by the following: 1) long-term supply commitments; 2) long-term price stability; 3) bulk transportation systems to enjoy economies of scale; and 4) the sulfur content. I believe that the first three factors are more significant than the question of sulfur. Outside the United States, in general, up to about 2% sulfur coal may be burned without many problems. With higher sulfur content, one would have to consider the location of the power plant, economy of sulfur extraction, and corrosion problems.

FACTORS AFFECTING INTERNATIONAL UTILIZATION OF HIGH SULFUR COAL

William W. Mason

Thank you, Mr. Chairman, and good afternoon ladies and gentlemen. It is a pleasure for me to attend and to be a part of this conference on the marketing potential of high sulfur coal into the export market. In doing so, I should like to do the following: give you a brief history of the exports of U.S. coal abroad; outline a few things my company is doing in the line of transportation to increase U.S. exports; offer comments on the export market as I see it now and in the future; comment on the transportation and port constraints which this past year have had a great impact on our marketing capabilities abroad; and then give you a few of my observations as to the markets abroad for high sulfur coals and what we can do to expand these markets in the coming years.

To start on the positive side, my company and I are bullish on the future of the marketing opportunities of coal in the 1980's and 1990's. To support this confidence, my parent company, Occidental Petroleum Corporation, is backing our future course with capital investments of several hundred millions of dollars in mines, transportation equipment and terminals.

COAL PRIOR TO WORLD WAR II

As I am sure a number of you know, the U.S. exported coal until World War II predominantly from our eastern coalfields for almost 100 years. While our export market for coal has not been a major market--averaging about 10% of our annual production--it has been an important market. Prior to and following World War I, coal was exported to Europe in fairly good quantities for steam and heating use. Coal was exported all through the 1930's in varying quantities primarily to Europe and Canada. During this period, too, most of the coal exported was designated as steam coal, with most of it moving through our eastern and lake ports. In 1947, following World War II, we had a banner year when we exported over 68 million tons. This was mostly steam coal shipped from our eastern ports and mostly in 10,000-ton liberty vessels. To a great extent, this coal moved to Europe for the rebuilding and reconstruction of that war-torn area.

COAL DEMANDS FROM 1950-80

In the 1950's, 1960's and 1970's, with the exception of Canada, the demand shifted from steam coal to coking coal. This was the period of the development and construction of the many steel mills around the world that used, and required as a base, coking coals from the United States. Japan became the largest single receiver of American coals, and in 1975 received from the United States over 27 million tons, or over 40% of all the coal exported. During this period, coking coal was shipped to almost every country in Europe with a steel plant and also to developing areas of South America--Brazil, Argentina and Chile.

SHIFT FROM COAL TO OIL IN 1979-80

It was not until 1979 that the market overseas began to shift again to steam coal. In 1979 out of a total of 51 million tons exported, excluding Canada, only about 2.4 million tons were categorized as steam coal, the remaining being coking or metallurgical coal. Why did this take place? If you will recall, this was the year of the big jump in oil prices. Europe, which was almost entirely dependent upon mideastern oil, concluded that the time had come when it could no longer depend upon, nor pay the price of, energy from oil and looked to alternate sources. Coal, and American coal in particular, appeared to be the answer, so in 1979 and 1980 we had many delegations visit our country to explore the possibilities and potentialities of securing coal for the conversions and expansions of their utility and steam requirements. Japan and the Far East, also heavily dependent upon foreign oil, began to look to other fuel sources; and while Australia, western Canada, Poland and South Africa were their more natural sources of supply, they too began looking to the U.S. as a source.

CURRENT STATUS OF U.S. EXPORT MARKET

In 1980 we exported almost 90 million tons of coal. Of this, 63 million tons were metallurgical, with the remainder steam, which was a great increase from the previous year. This year, 1981, we had earlier predicted and expected to ship about the same amount as last year; however, with the UMWA shutdown, this forecast will no doubt be downgraded, although I feel with the resumption of operations, the export market will pick up rapidly. I must say here that we have lost some credibility among our foreign customers and potential customers by our inability to perform in the manner in which they would desire during these last couple of months.

ISLAND CREEK'S MINING AND TRANSPORTATION

As I previously mentioned, I would like to tell you a few things my company is doing with regards to mining and transportation that I feel will assist in the marketing of Illinois Basin coals. At Island Creek we currently have recoverable reserves of 3.8 billion tons. We are bringing on new mines which will increase our production capacity beyond 35 million tons per year. Our plans call for continued growth, through the 1980's and ensuing years, in production and distribution terminals. The concept to develop river terminals and other transportation needs at Island Creek came about in 1977. Our long-range and strategic planning revealed that we needed to become less dependent on historical distribution methods that restricted our growth and affected our ability to mine and deliver coal.

RAILROAD AND RIVER PLANS

We therefore embarked on a program to define the transportation bottlenecks that were adverse to our marketing plans. To this extent, we first acquired 525 railroad cars, at a capital investment of 16 million dollars. Next, we turned to Mr. Reliable, "Old Man River." We found the barge lines most cooperative in our plans for increasing coal haulage. Our river coal shipments amount to several

million tons annually. Our examination of the river system told us it had the capacity and could handle increased volumes. The rivers had demonstrated in the past the ability to handle some 130 million tons annually, despite certain interim lock and dam bottlenecks. We felt it was truly our best avenue for the expansion of markets. We also saw the need for adequate intermodal facilities.

RIVER TERMINAL DEVELOPMENT

We then began our development of new river terminals for the movement of additional coal to both the domestic and export markets. At present, there are three river terminals in operation. Their capital investment approximates over 70 million dollars. These are under the operation of Occidental's subsidiary, Kentucky-Ohio Transportation Company (KOT):

1. Big Sandy Terminal is located on the Big Sandy River south of Catlettsburg, Kentucky. It currently receives its coal by highway.
2. The South Shore Terminal, located at South Shore, Kentucky, on the Ohio River is served by the highway and the Chesapeake and Ohio Railroad. It was completed in April 1980, loading out its first barges and rail coal.
3. The Wheelersburg, Ohio, Terminal is also located on the Ohio River. Served by the Norfolk & Western Railway, it began receiving coal in December 1980.

These terminals, for the most part, load 15-barge tows hauling 22,500 tons each with sufficient fleeting areas for jumbo and even 3,000-ton super barges. The barges navigate the Ohio, Tennessee, and Mississippi River systems to domestic, utility and industrial plants. Coal will also be transshipped through the Gulf for export movement. In addition, KOT is developing a coal storage terminal at Baltimore in the area commonly known as Curtis Bay. Not only will KOT have a sophisticated transportation and ground storage facility, but its own ship and barge pier to go with it. Construction has been underway since July, 1980. Currently under extensive study is development of an additional facility in the Portsmouth, Virginia, area.

As you can see, Occidental has backed its hand through investment in railcars and terminals for building a transportation network to support our coal marketing programs. There is still much to be accomplished in order to achieve a more efficient program for the movement of U.S. coals. This includes eastern and western, both steam and metallurgical.

FUTURE COAL DEMAND

Now let us move to the future and see what is needed. What will the future hold? According to the World Coal Study, the Interagency Coal Export Task Force, and National Coal Association forecasts, there is a healthy demand worldwide for steam coals. While these and other studies may disagree on an exact level for this demand, they do concur that the "order of magnitude" is sufficient to warrant an expansion in this country of our marketing capabilities directed toward meeting overseas demand. We already have

sizable excess production capacity to support increased exports, and we can readily add to this capacity as needed.

To demonstrate this "order of magnitude," consider these ranges of tonnage forecasts starting with 1985:

1. For Western Europe alone, the imported steam coal demand is forecast in the range of 100 to 125 million net tons. By 1990, this range is expected to be 150-190 million tons. By 2000, the range is expected to be 270-340 million.

2. Even if imports actually fall on the low side of these ranges, they clearly demonstrate that a large market for steam coal is rapidly developing in Western Europe alone.

3. Turning to the Pacific Rim area, which includes Japan, Korea and Taiwan, projections also abound, but the ranges of these projections are not as extreme. For 1985, steam coal import requirements are forecast at 40 million tons; the 1990 forecast is 90 million, and by the year 2000 imported coal demand is projected to be above 200 million tons.

Totalling these projections and using the low figures in the ranges, we obtain the following forecast figures for imported steam coal demand in these two major overseas markets, Europe and the Pacific Rim:

1985---140 million tons
1990---240 million tons
2000---470 million tons

The National Coal Association report also makes this projection for world metallurgical and steam market import requirements. The forecast shows a total import range of 274 to 343 million tons of coal for 1985 as compared to 243 million tons in 1979. By 1990, this range is projected to increase from 382 to 467 million tons. The U.S. is expected to supply 30% of this demand. Other studies concur that the U.S. could supply one-third of the world's coal demand from imports.

INCREASING PORT FACILITIES, RAILROAD STOCK, AND PIPELINES

For the U.S. to increase exports over the long term, additional terminal and transportation capacity will be required. Terminals are being added at Baltimore. Others are being planned at Norfolk and at other East, Gulf and West Coast areas to be served by barge and by railroad. In addition, a number of improvements have been made at existing facilities of the Chessie and N & W at Hampton Roads, along with those in the New Orleans and Mobile area. New river terminals have also been developed to support export movements via our inland waterways. Therefore, affirmative action is being taken to increase our nation's future port capacity. At last count, some 37 terminals already have been announced as being built throughout the country with a capacity of 479 million tons by 1985. How many of these facilities will materialize and at what actual capacity remains to be seen (see Appendix A).

By no means do we downplay what the railroads have done in improvements to their plant and rolling stock, nor the equipment investments being made by the trucking and barging companies. Pipelines are also being considered to transport the coal in slurry form. These elements contribute significantly and are essential to our delivery capabilities.

GOVERNMENT, PRIVATE INVESTMENT AND DREDGING

While the private sectors have reacted expeditiously to the obvious market potentials and have begun to commit investment dollars, there still needs to be accelerated action on the part of government. Take dredging! Currently, all of our major coal ports, and all of those proposed, have channels of 45 feet deep or less. This means that the maximum size of vessel that can depart fully loaded is Panamex size on the order of 60,000 to 70,000 tons. Only one port, Hampton Roads, can handle vessel loads of 100,000 tons or just slightly greater. Ocean freight costs per ton are $5-$7 per ton lower in a 150,000 ton vessel as compared to those of 100,000 tons. Freight costs quickly escalate for vessels below 100,000 tons. Our world competitors now have, and continue to build, facilities to load these large colliers.

The Army Corps of Engineers has the responsibility of dredging and maintaining channels and harbors, but before work can begin deepening those channels, feasibility studies and environmental impact statements must be prepared and approved. Permits must be obtained. Finally, monies must be authorized and appropriated by the Congress for these river and port projects. We are encouraged by the number of proposals introduced in the 97th Congress thus far, which among other things would accomplish the following:

1. dredging harbors and channels on the East, Gulf and West Coasts to depths of 55 feet or more; and
2. fast-tracking the environmental review and permitting process for both shoreside facilities and for port and harbor improvements, etc.

We recognize the fact that future federal funds might not be made available for dredging programs. Therefore, the coal industry must make further commitments to insure its destiny. In this regard, if the administration will fast-track its permitting and environmental policies, then we are prepared to pay our fair share of dredging expenses. Such a position has been adopted by the coal companies under the National Coal Association.

REVISION OF RAIL FREIGHT RATES

Another major item of importance pertains to rail freight rates. More cooperation and understanding is needed from our railroads in the setting of rates to tidewater and river ports. These rates, when coupled with the investments in terminals, vessel loading delays and demurrage make the total in-vessel cost for U.S. coals even less competitive with other foreign coals. We do not imply that our railroads should not be profitable or make a fair return in the pricing of their services. However, they need to provide some form of freight pricing stabilization to encourage exports and intermodal movements. Contract rates and tonnage guarantees would be one means to ensure carrier revenues.

IMPEDIMENTS TO ILLINOIS BASIN COAL DEMAND

Illinois Basin coals have historically and predominantly moved to, and served, the domestic, industrial and utility markets--and to some extent, the metallurgical market--in the nearby midwestern

area. This has been a good and dependable fuel source for this area and, to a great extent until the last 10 years or so, satisfied the area's productive capacity. Unfortunately, while U.S. production has increased in recent years, Illinois Basin coals have not enjoyed this increase in demand. I feel this has been due to several factors: 1) Illinois Basin coals are a bit lower in heat content than eastern coals, but, when cleaned, generally can be in the 12,000 Btu range; 2) Illinois Basin coals have generally moved by river and rail to markets within a several hundred mile range; 3) Illinois Basin coals have heretofore not moved to the export market due to their location in mid-America, and steam coals until very recently were not exported to any great extent except to Canada; 4) Illinois Basin coals have been greatly affected by the influx of gas in the metropolitan areas and the environmental restrictions instituted by the EPA due to the higher sulfur content of most of the coals originating from this area. While there may be other reasons, I feel that these fairly well cover the reasons behind the static or declining use of Illinois Basin coals.

ILLINOIS BASIN RESERVES AND POTENTIAL

From a reserves standpoint, this area is a vital energy source, one estimated to have over 200 billion tons of identifiable and recoverable reserves. The area has a number of our nation's best and most- qualified producers; this area has a mature and stable labor force. With the growing demand for steam and industrial coal abroad and with a transportation network comprised of the Mississippi River and progressive railroads, it would seem that there is no reason why these coals of better-than-average quality should not find their place in the energy-short areas of Europe and the Far East.

HIGH SULFUR PROBLEM

The one and only reason why Illinois Basin coals would not be marketable in the world market is the higher sulfur content of these coals. Export coal buyers generally fall into four general categories where sulfur specifications are concerned:

under 1%
up to 1.5%
1.5 to 2.5%
2.5 to 3.5%

Illinois Basin coal by itself cannot fit easily into the first two categories. Some coals from this area might fit into the third category, with more falling into the last category. The larger percentage of utility and industrial coal demand now falls in the third category--1.5 to 2.5% sulfur.

COAL BLENDING

As I see it, the best way for these Illinois Basin coals to fit into the growing export market is by utilizing a blending procedure at port in or around the New Orleans area. Lower sulfur coals from the eastern area--up the Ohio--can be loaded by barge and assembled

with barges loaded on the lower Ohio or Mississippi River to meet the required sulfur specification when loaded into vessels at the port. Barges can be transloaded intermittently or loaded from storage to ensure the needed quality. Many Illinois Basin coals can be loaded directly to the river, thus reducing the cost of transportation. You also have an excellent railroad system that serves your area and the ports of the South. In utilizing your railroad system, blending of coals would probably be most effective by combining river movement of lower sulfur coals with higher sulfur Illinois Basin coals at one of the terminals in the port area.

The demand for steam coal overseas will be great in the years ahead, and with the capacity that presently exists in this area for producing coal, and with the transportation system that is already available, and with proper coordination and planning, I can see no reason why Illinois Basin coals should not find a more prominent place in the export market.

We hear today much about our having an energy crisis. We in this country have no energy crisis. Our country is blessed with an abundance of energy or potential energy. We have an oil crisis; we are dependent upon foreign oil at whatever price it may be. We should make use of our coal resources. In conclusion, I feel that the coal industry can be optimistic about the opportunities for export coals and in attaining successful long-term marketing programs. We have much to gain if we react expeditiously to this rapidly developing worldwide coal demand. Finally, our nation, our state, and our industry must demonstrate to those here at home and throughout the world that we have the resources and capabilities to produce and supply both the needs of the U.S. and those abroad with our most abundant fuel source--coal.

APPENDIX A
EXISTING, PLANNED AND AND ANNOUNCED PORT CAPACITY FIGURES (In Millions of Tons)

	1981/82	1983/84	1985/86
EAST COAST			
Port of Quebec, Canada			
1. Cast Group	6 MM	20 MM	20 MM
Albany, New York			
2. Atlantic Cement	1 MM	2 MM	2 MM
3. New Amsterdam Coal	2 MM	4 MM	4 MM
Fairless Hills, Pennsylvania			
4. United States Steel	-	3 MM	10 MM
Camden, New Jersey			
5. Alla-Ohio Valley Coal	2 MM	3 MM	3 MM
6. Camden Coal Terminal	2 MM	3 MM	4 MM
Philadelphia, Pennsylvania			
7. ConRail	4 MM	10 MM	10 MM
Baltimore, Maryland			
8. Chessie System	10 MM	12 MM	12 MM
9. Kentucky-Ohio Transportation	-	10 MM	10 MM
10. Consol	-	10 MM	10 MM
11. Pittston Co., Mapco Inc., Elk River Resources, Old Ben Coal Co., Utah Int., Soros Assoc. (Anne Arundel County)	-	-	15 MM
Hampton Roads, Virginia			
12. Chessie System	14 MM	15 MM	16 MM
13. Norfolk & Western Railway	32 MM	35 MM	35 MM
14. Cox Property at Portsmouth to be developed either by A.T. Massey, Pittston Co., Consol and Island Creek or the N&W Railway	-	10 MM	25 MM
15. Ashland Oil Inc., Westmoreland Coal Co., Utah International Inc., and Armco Inc.	N/A	N/A	N/A
Morehead City, North Carolina			
16. Alla-Ohio Valley Coal	3 MM	6 MM	15 MM
17. Gulf Interstate Coal Terminals	-	10 MM	20 MM
Wilmington, North Carolina			
18. Atlantic Resources, Inc. (American Coal Export Co.)	2 MM	4 MM	8 MM
19. Utah International Charleston, South Carolina	N/A	N/A	N/A

	1981/82	1983/84	1985/86
20. Massey Coal Terminal	2 MM	4 MM	8 MM
Savannah, Georgia			
21. Savannah Coal Terminal, Inc. Harbert, Elk River and Family Lines)	-	5 MM	15 MM
22. Hutchinson Island Coal Co. (Strachan Shipping Co. & Pope Evans Robbins, Inc.)	-	6 MM	12 MM
23. Southern Minerals Corporation	4 MM	8 MM	13 MM
Total East Coast: Eleven port areas with 24 coal handling facilities.	84 MM	192 MM	282 MM
GULF COAST			
Mobile, Alabama			
1. McDuffie Terminal	5 MM	10 MM	20 MM
New Orleans, Louisiana			
2. International Marine Terminals	4 MM	9 MM	12 MM
3. Electro Coal Transfer Corporation	10 MM	15 MM	20 MM
4. River & Gulf Transportation	-	12 MM	20 MM
5. Port of New Orleans/Ryan Walsh Stevedoring	2 MM	5 MM	10 MM
Baton Rouge, Louisiana			
6. United States Steel	-	12 MM	15 MM
7. Louisiana Coal Services	-	5 MM	10 MM
8. United Energy Resources	-	8 MM	15 MM
Steeltown, Texas			
9. Texas-Oklahoma Port Company	5 MM	5 MM*	5 MM
Galveston, Texas (Pelican Island Bulk Terminal)			
10. Galveston Port Authority	-	10 MM	20 MM
Total-Gulf Coast: Five port areas with ten coal handling facilities	26 MM	91 MM	147 MM

*Note: With the addition of a second stacker-reclaimer capacity can be increased to 10 million tons per year.

	1981/82	1983/84	1985/86
WEST COAST			
Long Beach, California			
1. Metropolitan Stevedore Company	2 MM	5 MM	15 MM
Los Angeles, California			
2. Port of Los Angeles-Terminal Island	3 MM	12 MM	20 MM
Port of Kalama, Washington			
3. Pacific Resources, Inc.	-	5 MM	15 MM
Total-West Coast: Three port areas with three coal handiing facilities.	5 MM	22 MM	50 MM
Grand Total-Port Capacity for U.S. Coal	115 MM	305 MM	479 MM

MARKETING MECHANISMS FOR THE EXPORT OF HIGH SULFUR COAL

Arthur F. Nicholson

The need for additional markets for high sulfur coal does not have to be documented anew. There has been ample evidence of decreasing production and increasing unemployment in the Illinois Basin coalfields since 1977. The rate of growth of coal-fired electric generating capacity east of the Mississippi River has been and will be too low to provide the needed markets. Other current domestic markets for high sulfur coal are too small to be of any consequence. On the plus side, however, the high cost of oil is causing many industrially developed countries to turn to coal as a fuel for their electric utilities.

The most prominent areas for export markets are the Pacific Rim countries, i.e. Japan, Korea, Taiwan, Hong Kong, and Singapore and Western Europe. Japan, with few domestic coal resources, has been active in the development of technology to control the emissions from burning coal, and along with the other Pacific Rim countries, will be a growth market for coal. Unfortunately, the coal resources of Australia, the western U.S. and western Canada are more favorably located to serve the Japanese markets than is the Illinois Basin's high sulfur coal. Because of transportation networks and costs, Western Europe is a more logical market for Illinois Basin Coal, and the emphasis in this paper will be concerned with mechanisms to serve that market.

It could be argued, and probably will be, that no new marketing mechanisms are needed for high sulfur coal. There are several coal-producing companies and coal brokers who are heavily involved in marketing coal to Western Europe. It is not our purpose to criticize them for lack of knowledge or lack of effort to market high sulfur coal. While there are some notable successes, clearly there are not enough successes or this hearing would not be necessary. Therefore, we would like to suggest some ideas that may be useful in expanding the markets for high sulfur coal.

Except for limited specific situations, potential coal users in Western Europe are looking for low sulfur coal. As described below, the technology to burn high sulfur coal lags behind the U.S. experience. Being painfully aware of the slowness of U.S. electric utilities to install equipment that would permit the utilization of high sulfur coal, it is our feeling that significant growth in high sulfur coal markets in Western Europe will develop slowly without external stimulus. The external stimulus cannot simply be more sales effort. We need a different kind of sales effort, one that is long term and that meets the competition in terms of cost, reliability, and environmental concerns.

It is our observation that the focus of the producers and brokers is necessarily short term. The pressures to produce result in the immediate future make it difficult for them to expend significant effort to develop markets that will absorb coal only after 2 two or 3 years of marketing effort.

PRESENT WESTERN EUROPEAN SOURCES

The competitors for the Western European coal market are the domestic coal resources (which range from almost none in Italy to

substantial in England and Germany), and South Africa, Poland, Australia, South America, and other miscellaneous sources. South Africa is well situated to serve a limited share of the market, but must conserve its resources for its own energy needs. The problems with relying on Poland are well known. Australia is more logically a supplier to Japan, and South America is a limited supplier. The U.S. is the best and most reliable source of steam coal for Western Europe. Appalachian coal is the preferred choice at the moment by several coal users in Europe, quite possibly because Appalachian coals are somewhat similar to the design coals used in the coal-fired plants.

The implication is that if high sulfur coal is to become widely used in Western Europe, a significant effort will be needed to cause the boilers to be designed to use Illinois Basin high sulfur coal. For that to happen the utility building the plant or the company installing industrial-sized boilers must be convinced that the cost and reliability of using high sulfur coal is both equal to or better than using other fuels.

MARKET PRICE AND RELIABILITY

The cost aspect of the equation in terms of market price can be determined readily by competent and respected consultants. The problem is, as it always was, to establish valid assumptions about the nature of future costs of the different fuels. Therefore, reliability of supply becomes a highly significant factor.

Reliability of supply has even more overtones in an export market than in a domestic market where producer or transportation work stoppages are the chief concerns. In addition to these two, there are at least two other important considerations in an export market. Political stability in the exporting country and the likelihood of obtaining export permits are a significant consideration in reliability. Another is the willingness or capability of the seller to fulfill the contract when better market opportunities or unforeseen problems arise. This last consideration is especially important when small companies are involved.

Our effort in Kentucky has been to develop a synfuel market in western Kentucky to provide a market for our high sulfur coal and to work on an export market for our eastern Kentucky coal. East Kentucky is characterized by a large number of independent producers who individually cannot service the export market. Our initial thought was to establish a producers' cooperative that would include enough coal resources to support a long-term contract. However, a cooperative by itself is insufficient. There is still the problem of reliability of supply. A cooperative may not be strong enough to ensure that all members meet their contractual obligations. We found it necessary to establish an authority, a nonprofit public corporation, to perform certain functions in the Commonwealth's best interests. Through this mechanism, we believe we can act as a conduit between our independent producers and the export market.

TECHNOLOGY FACTORS AND THE EXPORT MARKET

At this point in the development of our export market, we have urged the West European countries to plan to use high sulfur coal and have offered technical assistance through our coal laboratory. There is some polite interest, but the emphasis is still on low

sulfur coal. The task will be to demonstrate clearly the economic advantages of burning high sulfur coal. We are developing the staff capability to perform that task and they are honing their skills on coal versus gas and oil fuels for industrial-sized plants.

In the comparison, below, of technology and cost factors of differing air pollution abatement options, it can be seen that we need to make more cost-effective the options for using high-sulfur coal in Western Europe. It is imperative that we demonstrate the environmental and economic feasibility of synthetic fuels, of fluidized bed combustion, of coal-oil mixtures, etc., if we are to convince foreign buyers, whether utilities or industry, that Illinois Basin coal is a viable alternative to their present sources. This, plus the lower cost, compared to other fuels, and the reliability of the source, will make Illinois Basin coal competitive in the export market.

WESTERN EUROPEAN CONTROL STRATEGIES AND ABATEMENT OPTIONS

As noted above, most European countries utilize low sulfur coal as a primary means of meeting air pollution control regulations. However, there are several future abatement options which offer potential for opening the European markets to higher sulfur coal. A marketing strategy Illinois Basin coal must have is the increased demonstration of the technological feasibility and cost advantages of these options.

PRESENT POLLUTION CONTROL STRATEGIES

Most of the European countries have adopted air pollution regulations. Sulfur dioxide and total suspended particulates are the two principal pollutants from coal combustion regulated in industrial countries. Ambient air quality standards or guidelines for these have been established in many countries, as shown in Table 1. The standards are in some cases considerably more stringent than in the U.S. The extent to which European countries have succeeded in meeting their standards has not been documented, but it is generally felt that improvements have been made for sulfur dioxide.[1]

The legislative controls on sulfur emissions vary widely, as shown in Table 2. Most have explicit requirements for emission limits or for the sulfur levels in the fuel. Most countries also regulate stack heights to limit ambient concentrations. No legislation has yet been enacted to control long-range transport; however, limiting emissions has an indirect beneficial effect.

FUTURE ABATEMENT OPTIONS

The development of alternative methods for sulfur removal will be essential to the use of high sulfur (3-5%) Illinois Basin coal in Europe. The steam coals used there now are uniformly low in sulfur; the 1975 average for 12 countries varied between .7 and 1.4% sulfur.[2]

Due to large price increases and the continuing uncertainties of supplies, further increase in the use of low sulfur fuel oil appears unlikely. But substantial quantities of low sulfur coal are

known to exist in major coal-producing countries. What is not clear are the political, social, and economic constraints that will determine the availability and price of low sulfur coals in domestic and international markets. A number of abatement strategies that offer an option to the use of low sulfur fuels are discussed below.

Stack Height

Tall stacks are an effective means of reducing local concentrations of sulfur dioxide. This means of control has been widely used in England and, to a lesser extent, in other countries, e.g., France and Germany. This is an inexpensive and technically simple control measure. As no reduction in total sulfur emissions is achieved, long-range transport problems will not show any concomitant improvement; in fact, they may be somewhat exacerbated by taller stacks.

Flue Gas Desulfurization (FGD)

FGD has received much attention in the United States, particularly in regard to large coal-fired electric generating plants. Industrial application in the U.S. has been growing slowly. None of the European countries has made the commitment to FGD technology. In fact, in 1978, only six full-sized FGD installations could be counted[3], three in Germany, and one each in Norway, Sweden, and France. The technology is still viewed as too costly and technically unproven for widespread application.

Fluidized Bed Combustion (FBC)

FBC technology offers the promise of efficient sulfur removal at low cost. The process involves, however, some environmental tradeoffs, such as increased production of solid waste. More importantly, full-sized units are only now in the planning stage and it is unlikely that commercialization will occur before the 1990's. Partially offsetting this disadvantage is the fact that FBC may be cost-effective for retrofitting existing boilers.

Synthetic Fuels

Also on the horizon are technologies for the conversion of coal to clean gaseous, liquid, and solid fuels through the processes of gasification, liquefaction, and solvent refining. Each of these technologies is under development in the U.S. and one, the SASOL Fischer-Tropsch Indirect Liquefaction Process, is in commercial operation in South Africa. Small-scale gasification is already being practiced in Europe and elsewhere and may provide the earliest alternative fuel for industrial use. Each of these technologies is suitable for high sulfur Illinois Basin coals. Again, widespread application of synthetic fuel processes probably will not occur until after 1990 in the U.S. and even later in Europe.

Coal Cleaning

The mechanical cleaning of coal is best known as a means of reducing the ash content and increasing the heating value of run-of-mine coal. With increasing concern over sulfur dioxide, these processes are being reexamined for their sulfur removal potential. The method is effective for pyritic but not organic sulfur removal. Illinois Basin coals typically contain about 50% pyritic sulfur. Thus, reductions to the equivalent of 2-3% sulfur coal are possible, which is still high by European standards. Washed coals could be blended with low sulfur coal to meet specific sulfur limits.

Although coal washing for sulfur removal is not viewed as cost-effective in England, countries like Germany and Poland have planned greatly expanded coal washing capacities.[4] In the future, chemical coal cleaners using reagents like oxygen, chlorine, or ferric iron may allow high removal of organic and pyritic sulfur. Such processes do not appear to be near commercialization yet. The cost of chemically cleaned coal is expected to be high.

Coal-Oil Mixture

High sulfur coal may be mixed with oil to produce a low sulfur fuel called "coal-oil mixture" (COM). COM can either be transported to or mixed at) the site of use. Boilers can be retrofitted to burn COM, but existing oil or gas boilers will suffer some derating. The process is technically simple, but many potential problems (e.g., tube corrosion and particulate control) have yet to be evaluated.

In summary, it is our opinion that the most critical mechanism needed to market high sulfur coal is to demonstrate that high sulfur coal can be burned in accordance with environmental standards at a competitive cost and that the coal will be there when needed. We do not believe enough is being done to convince buyers from overseas markets.

TABLE 1

AMBIENT AIR QUALITY STANDARDS FOR SO_2 AND PARTICULATES IN INDUSTRIAL COUNTRIES[a]

Group or Country	Sulfur Dioxide			Particulate Matter		
	Annual	Daily	Other	Annual	Daily	Other
Canada	60 30[b]	300 150[b]	900 450[b]	70 60[b]	120	
European Community	80 (PM 40) 120 (PM 40)	350 (PM 150) 250 (PM 150)	130 (PM 60)[c] 180 (PM 60)[c]			
Finland	180	250	720[d]	180	250	720[d]
France		250			350	
Germany, Fed. Rep			140[f] 400[g]			200[f,n] 400[f,n]
Italy		260	650[d,h]		300	750[h,k]
Japan		100	260[i]		100	200[i]
Norway		200	60[c] 400[i]		120	40[c]
Spain	150	400	256[j] 700[k]	130	300	200[j]
Sweden		300[c] 200[f]	60[c] 750[i]		120	40[c]
U.S.	80	365	1300[b,l,m]	60[b]	75 150[b]	260 m

[a] As of 1978

[b] Secondary standard

[c] 6-month average

[d] ½ hour average

[e] Maximum value

[f] Longterm average

[g] Short-term average

[h] Special zones

[i] 1-hour average

[j] 1-month average

[k] 2-hour average

[l] 3-hour average

[m] Various state standards also may apply

[n] Also, half this value for 10

Source: E. S. Rubin "Air Pollution Constraints on Increased Coal Use by Industry. "An International Perspective," Journal of the Air Pollution Control Association, 31(1981):34960.

TABLE 2
LEGISLATIVE CONTROLS ON SULPHUROUS EMISSIONS IN SOME ECE COUNTRIES

	Planning	Investment Decisions	"Polluter Pays"	Financial Incentives	Nuisance & Health Laws	"Alert" periods	Low S fuel, nationwide	Low S fuel, SPZ's	Low S fuel, "Alerts"	FGD Option	Emission Limits	Air Quality Criteria
AUSTRIA							?					X
CANADA											X	X
CSSR	?		?					X	X		?	
DENMARK	X			X			X	X				
FINLAND	X				X		?				?	?
FRANCE				X		X	X	X	X			
GFR	X					X	X			X	X	
HUNGARY	X	X	X					X			X	X
IRELAND	X						X					
ITALY							X				X	X
LUXEMBOURG							X					
NETHERLANDS							X			X	X	
NORWAY	X		?				X	X		X		
POLAND		X	?								X	
SWEDEN							X	X				
SWITZERLAND							?					
USSR	X		X								X	X
UK	X			X	X		X	X			X	
USA											X	X
YUGOSLAVIA		X	X		X						X	

X Implemented wholly or partially
? Implementation under consideration

Source: R. A. Barnes, "The Long Range Transport of Air Pollution. A Review of European Experience", Journal of the Air Pollution Control Association 29(1979):1219-1235.

NOTES

[1]"The State of the Environment in OECD Member Countries" (Paris: OECD, 1979).

[2]"Clean Fuel Supply" (Paris: OECD, 1979).

[3]Barnes, R. A. "The Long Range Transport of Air Pollution. A Review of European Experience." Journal, Air Pollution Control Association 29(1979):1219-1235.

[4]Rubin, E. S. "Air Pollution Constraints on Increased Coal Use by Industry. An International Perspective." Journal, Air Pollution Control Association. 31(1981):349-360.

THE COAL RESOURCES OF ILLINOIS

Heinz H. Damberger

The estimate of total coal resources in the ground of Illinois has not changed significantly since 1908 when DeWolf published a first estimate of 137 billion tons. We know now how remarkably accurate DeWolf's estimate was; but DeWolf himself would probably have been surprised to find that Cady and co-workers of the Coal Division of the Illinois State Geological Survey ended up with exactly the same total of 137 billion tons after a very thorough review of the substantial amount of information that had been collected by Survey geologists by the early 1950's (Cady, 1952). Cady's comprehensive assessment published in an Illinois State Geological Survey Bulletin remains the most detailed statement on the coal resources of Illinois as to their distribution by area and coal seam, thickness, and certainty of presence.

SURFACE-MINABLE COALS

But certain important elements were still lacking. For instance, surface-minable coal resources were not separately identified. The Survey is only now closing this gap of the 1952 coal resource assessment: the first of nine reports on the surface-minable coal resources of Illinois appeared in 1957; the last is to be published in 1981. In the course of these studies, about 20 billion tons of coal resources were identified as potentially surface-minable. A study by C. Treworgy and others, completed in 1978 (Illinois State Geological Survey Circular 504), took a careful look at these 20 billion tons and identified about 6 billion tons of coal in the ground that satisfy a number of criteria which are comparable to those of current surface mining operations, in particular reserve block size and overburden ratio.

UNDERGROUND MINABLE COAL

The underground minable coal resources were also updated as additional information became available to the Survey. Hopkins and Simon summarized all published information available to 1973 for the First Annual Illinois Energy Conference in Chicago in 1973. Due to new mapping since the 1952 study, the total now stood at 148 billion tons.

In 1975, the Survey published its Cooperative Resources Report No. 4 (Smith and Stahl) which added substantial coal resources for the two main coal seams of Illinois, the Herrin (No. 6) and Springfield (No. 5) Coals, based on updated coal resource maps at the Survey. The new total for the state was almost 162 billion tons. The 14 billion tons higher total resulted primarily from an upgrading in thickness from the 1952 report (Bulletin 78) and from new mapping. The tonnages for coals other than No. 6 and No. 5 were still primarily based on the 1952 data of Bulletin 78.

Since 1978, the Survey has been assessing the deep-minable coal resources of Illinois in much greater detail than ever before. This study is supported by the U.S. Geological Survey, through the University of Illinois. Fifteen parameters are used for classification: seam thickness, depth, coal quality (e.g. heating value,

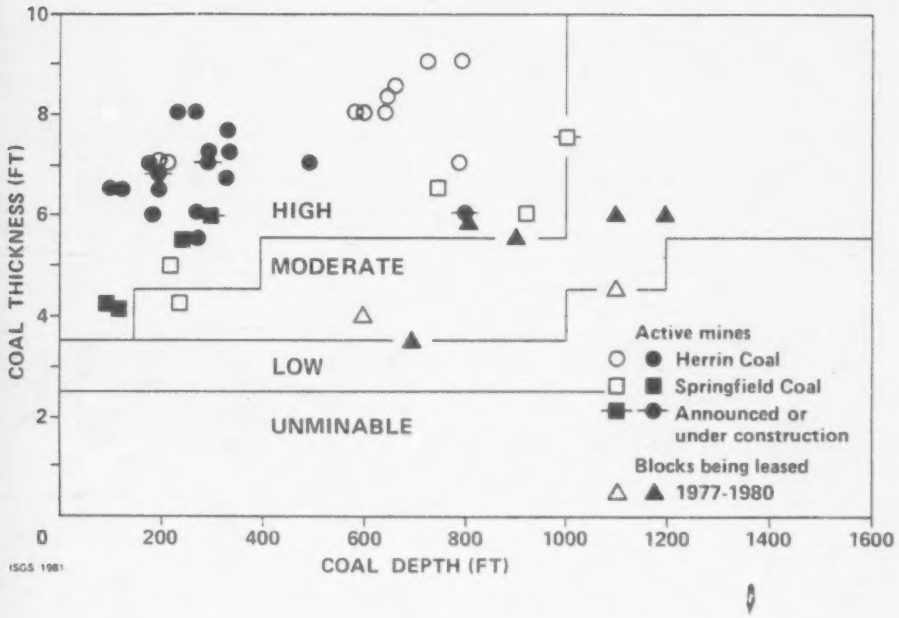
sulfur content), development potential (comparison to characteristics of coals being mined and leased), and a number of land-use parameters. Data available at the time of this writing are still preliminary. The total coal resources in the ground will again increase. About one-third of the deep-minable resources fall into the "high potential" category; that is they are comparable in thickness and depth to coals currently being mined (Figure 1). Another one-third is classified as having moderate development potential. This coal is comparable to coal of marginal current potential; however, companies are actively leasing it for future development. The remaining third has a low development potential. Detailed results of this study, which opens a new perspective on the coal resources of Illinois, will be published soon by C. Treworgy, who has been in charge of the project.

SULFUR CONTENT

About 5% of the mapped remaining coal resources of Illinois have a sulfur content of generally less than 2.5%, probably averaging 1.5 to 2%. Relative to the 95% of resources with 3 to 5% sulfur content, this is low sulfur coal. Our low sulfur coal has been and will continue to be mined preferentially. Even only 5% of the total resources is still a substantial amount of coal, about 10 billion tons in the ground, or about 5 billion tons after mining and cleaning losses. After cleaning, our low sulfur coal has sulfur contents between .8 and 1.8%. Current production from this reserve base is around 17 million tons per year, 2 to 3 million tons of which are committed to the metallurgical coal market.

Apart from their high sulfur content, the remaining 95% are attractive in many ways. They occur concentrated in a relatively few and very persistent coal seams, in large contiguous blocks, mostly at a depth of less than 1,000 feet, and surrounded by rocks generally favorable to underground mining. Well over 10% are close enough to the surface to permit less expensive strip mining. Illinois coals are all of bituminous rank with a relatively high heating value (average of 10,800 Btu/lb for delivered coal in 1979). Most mined coals have few shale partings and are moderate to low in ash content. For their rank, they are relatively high in volatiles and hydrogen, a definite plus for conversion of coal to hydrocarbon liquids and gases. And in some of the coal conversion processes (e.g. solvent refined coal), the relatively high sulfur content will actually become an advantage.

FIGURE 1
ILLINOIS COAL RESOURCE



Note: By plotting active underground coal mines and coal reserve blocks being leased or purchased in a diagram with coal thickness and coal depth as coordinates, one can develop a classification of deep-minable coal resources into those with high development potential (equal to fields of active mines, with one exception), moderate potential (now mostly occupied by leasing), and low potential (no active leasing). Note that many of the deeper mines now mine low or relatively low sulfur coal (open symbols).

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ILLINOIS COAL EXPORT POTENTIAL AND INTERNATIONAL PRICE COMPETITIVENESS

C. Kent Garner

I am pleased to have the opportunity today to review the export potential for Illinois coal in the international steam coal markets likely to emerge between now and the end of the century and its price competitiveness in today's market, plus factors which will affect Illinois' future competitiveness. My fellow panelists have already described the characteristics of Illinois' coal resources and their likely development in the coming years.

RISING COAL DEMAND

Regarding the supply/demand nexus, the fundamental theorem of the steam coal market is that the market is demand driven. That is, an increase in supply will not unilaterally cause increased demand --rather, greater demand generates increases in supply. Several recent, well- publicized studies of world coal demand, such as The World Coal Study, the International Energy Agency County Reviews, and the Interim Interagency Coal Export Task Force Report, though differing in their specific demand projections, all concluded a significant increase in world steam coal demand is virtually certain. The demand over the next 20 years projected by the Interagency Task Force for Western Europe and the Pacific Rim alone rises from 88 million short tons in 1979 to between 475 and 565 million short tons in the year 2000. This demand growth equates to overall annual compound growth rate of 8.8%-7.2% for Western Europe and 13.1% for the Pacific Rim. In the year 2000, Western European demand is expected to range from 273 to 343 million short tons while projected Pacific Rim demand ranges from 202 to 222 million short tons.[1] I believe, then, it is reasonable to assume the factor essential to stimulate the international steam coal market--strong demand--will evolve and, in fact, is materializing at this very moment. Of course, the quality specifications required by utility and industrial consumers will determine, to a large degree, the extent Illinois producers participate in this market.

LOW VS. HIGH SULFUR COAL

According to the Interagency Task Force, foreign steam coal consumers will require, in the near term, low sulfur (less than 1.5%) and high Btu (greater than 11,000 Btu per pound) steam coal for their existing and planned boilers and kilns. These specifications are required because, to date, outside North America the primary methods of achieving compliance with emission standards have been the limiting of fuel sulfur levels and the use of electrostatic precipitators. Scrubbers have not been widely utilized. More significant is that, with the exception of Japan, scrubbers are not presently included in the near-term plans for future utility and industrial power plants and kilns. Thus, European and Asian

consumers will continue to rely on relatively low sulfur coal.[2] Based upon discussions with our foreign clients, we at Continental Bank concur with this expectation.

Beyond the present planning horizon, in addition to relative fuel economics, national politics, and economic policies and growth will determine whether individual countries choose to bear the high front-end capital costs of scrubber installation and the resultant near-term effects on their balances of payments or opt for a more gradual economic adjustment process through paying higher prices for low sulfur coal, although this latter course may ultimately be more costly and may not minimize energy source dependence.

ILLINOIS COMPETITIVENESS

I would now like to review the general competitiveness of Illinois producers in Western Europe--the steam coal market which offers the best opportunities for Illinois coal. Over the last six months, the Coal Week quoted FOB mine marker price for Illinois spot sales has ranged from $20-$22 per short ton for 10,500 Btu per pound, 3.5% sulfur, and 13.0% ash coal and $25-$27 for 11,700 Btu per pound, 2.5% sulfur, and 8.5% ash coal. For term purchases, the range has been $21-$23 for the lower Btu, higher sulfur product and $27.50-$29.50 for the higher Btu, lower sulfur coal.[3] Recall these prices are indicative of the state of the market rather than actual transactions, that they reflect labor wage rates under the 1978 UMWA contract, and that they include an implicit seller's profit margin. Taking the midpoint of the spot price ranges and applying a worst-case sulfur penalty of 50¢/ton per 0.1% sulfur content above 1.5% and making a proportional Btu adjustment based on an 11,500 Btu per-pound requirement, the following adjusted FOB mine prices result:

low Btu, higher sulfur--$10.04/ton
($21--(20 x .5)) x (105 : 115)
high Btu, lower sulfur--$21.37/ton
($26--(10 x .5)) x (117 : 115)

At today's production costs, these prices are not attractive--a problem I will return to shortly. But, how do these adjusted prices compare on an energy-equivalent basis to other coals landed in Europe?

ILLINOIS VS. OTHER COALS IN EUROPE

Transportation to a Gulf Coast port by rail or barge would add $12 or $13, respectively, per ton. The barge/freight figure includes charges for mine-to-dock truck freight of $3/ton (15¢/mi. x 20 mi.), a loading charge of $1.00/ton, and an imputed transfer loss charge of $0.50/ton. Adding loading and unloading port charges totalling $4.50/ton and ocean freight, excluding any demurrage charges, of $12-$14/ton, places spot Illinois coal on Western European piers for the following adjusted prices: lower Btu, higher sulfur for $38.50-$41.50/ ton; high Btu, lower sulfur for $50-$53/ton. Using the midpoints of these ranges, Illinois coal can be landed at a cost of $1.90/million Btu and $2.20/million Btu, respectively. By comparison, similar computations show South

African and Australian coals representatively have a spot landed price of about $2.46 and $3.37, respectively, per million Btu.[4]

It seems clear that Australian steam coals are not price competitive in Western Europe and, assuming continued real price increases in ships' bunkers, they will likely remain uncompetitive due primarily to their sensitivity to ocean freight rates. Conversely, South African steam coals are competitive especially in view of their low sulfur content. And, South Africa's port throughput and ship loading capacities will insulate it from rises in bunker oil prices and be compatible with the increasing ship size capacities of major European coal ports. However, utility requirements for long-term, secure, consistent coal supplies evidenced by their reliance on long-term purchase contracts have already raised questions among some consumers of the dependability of South African suppliers in view of the country's political dilemma. And, Poland's reliability is of even greater concern. It is worth noting that consumers of other energy forms have always been willing to pay a premium for secure sources of supply.

I mentioned earlier that the adjusted FOB mine price for Illinois coal of $10 and $21 per ton would hardly cover current production costs let alone a profit for the producer. A recent study sponsored by the Electric Power Research Institute found that an FOB mine price of $23 to $33 per ton would be required to operate a new high sulfur Illinois coal mine profitably and that new mine development is being thwarted by current excess production capacity which is preventing producers from pricing coal in this range.[5] Given the demand-driven character of the market, price increases are unlikely until the current excess capacity is absorbed. Once it is, Illinois producers should be well positioned within the Western European price structure since a landed adjusted price equal to that of South African coal on an energy equivalent basis yields a quality-adjusted FOB mine price in Illinois of $28 per ton.[6] Thus, in the absence of excess U.S. capacity, the price presently being offered by South African producers to Western European consumers would support new mine development in Illinois and still permit some additional quality discounting. On an energy equivalent basis then, Illinois Basin coal is price competitive in Europe today!

POSITIVE FACTORS FOR ILLINOIS COAL

I would like to mention briefly several factors which will affect Illinois' future competitiveness. First, Illinois Basin producers are likely to be less sensitive to inland freight rate changes than Appalachian producers--Illinois' primary U.S. competitors in the Western European steam coal market. A sensitivity analysis by ICF of Washington asserts 1990 U.S. demand for midwestern coal would drop by only .5% in the event of a 33% rise in transportation rates over that period while demand for Appalachian coal would fall by 6.2%.[7] Though the ICF analysis focused on domestic demand, the comparative insensitivity of demand for Illinois coal to inland transportation costs would also show up at export locations, though perhaps to a lesser degree. Second, any freight rate increases which occur should be comparatively less than other regions' since Illinois Basin producers will doubtless benefit from the competition--intermodal and intramodal--due to being served by ten Class I railroads and numerous barge ports on four major rivers.

Another factor which should increase the competitiveness of Illinois coal is the productivity of Illinois' mines. The 1980 average mine productivity in Illinois was higher--both surface and underground--than any Appalachian state's average except Kentucky's. More important is the fact that 1980 Illinois surface and underground mine productivity increased over 1979 by 29% and 19%, respectively. Kentucky's surface mine productivity decreased 3% while underground productivity fell by 7%.[8] Continuing productivity gains will strengthen the competitive position of Illinois coal in world and domestic markets.

A final factor which may emerge in the world steam coal market to benefit Illinois producers is the inclusion of ash penalty clauses in purchase contracts. Ash disposal constraints in densely populated coal consuming nations, such as Japan and the Netherlands, have already led to their inclusion in some recent contracts. Illinois producers, on the average, should be less affected by this than their U.S. competitors in view of Illinois coal's lower ash content.

In closing, despite hurdles yet to be overcome--current excess U.S. production capacity, river and port loading and vessel constraints, the development and utilization of blending technology to open wider markets--which other sessions are addressing--I believe for the reasons reviewed earlier the future export potential for Illinois coal is good, though not to be taken for granted. To penetrate this growing market, Illinois producers must educate European consumers about the advantages they can offer, which may well offset market concerns regarding Illinois coal's sulfur content.

NOTES

1. U.S. Department of Energy Interagency Coal Export Task Force. Interim Report of the Interagency Coal Export Task Force (Draft for public comment): 3-1.

2. Ibid. p. 3-16, 18.

3. Coal Week 7(1-20) and 6(44-51).

4. Coal Week International. 2(16):5 and 2(15):4.

5. Electric Power Research Institute. "Coal Industry Problems." Coal Week 7(17):10.

6. If Illinois coal were priced on an energy equivalent basis with South African coal:

($2.46/MM Btu) x (11,700 Btu/lb) x (2,000 lb/s.t.) x (1/1,000,000)

FAS European Piers (U.S. $ per short ton)	57.56
Less:	
Ocean freight	(13.00)
Port, loading/unloading charges	(4.50)
Railroad/barge freight	(12.50)
FOB Mine Price	$27.56

7. Daniel Klein, ICF, Washington, D.C. statement at Coal Week/Energy Bureau Conference. Coal Week 6(42):7.

8. Productivity Report--4th Quarter 1980 and Preliminary Year 1980 for all Producers by State, County and Type Mining. (Washington, D.C.: Pasha Publications, March 25, 1981).

PRODUCTION CAPACITY AND RELIABILITY FOR EXPORT OF ILLINOIS COAL

Joseph S. Spivey

My name is Joe Spivey. I am President of the Illinois Coal Association, the trade organization representing the major coal mines operating in Illinois. I have been asked to address the question of production capacity in respect to the mines and mining operations of Illinois. First, let me point out that the Illinois Basin represents one of the largest coal reserve areas in the nation. The Illinois Geological Survey estimates that there are approximately 162 billion tons of bituminous coal reserves within this basin. We should consider ourselves, at least from an Illinois perspective, to be in a very unique position to capture markets from one of our largest natural resources-- coal. But upon reflection, one can easily and readily see several areas that should be addressed prior to making such an assumption.

U.S. PORT CAPACITY

Last year was a year of extraordinary growth for exports of U.S. coal. Total coal exports rose from 65 million tons in 1979 to 90 million tons in 1980. Coal contributed $4.5 billion to the positive balance of trade last year, up from $3.3 billion in 1979. However, U.S. coal exports were, and remain, limited by inadequate U.S. port capacity. We estimate that between 10 and 15 million tons of additional sales were lost in 1980 as a result of limited ports.

U.S. ROLE IN THE ENERGY MARKET

The U.S., which has supplied the world steel industry with a significant part of its coal for decades, is now being called on to help many of our national allies, particularly in Europe, to shift away from oil to coal in industrial and utility boilers. The explosion in this market is evidenced by the fact that overseas shipments of U.S. steam coal went from near zero in 1978, to 2.5 million tons in 1979, and to 16 million tons in 1980. We estimate that 1981 overseas shipments of this type of coal may reach 25 million tons. A recent study conducted by the Federal Government forecast U.S. overseas steam coal shipments reaching 200 million tons by the year 2000. Even at that level, the U.S. would supply only 38% of an estimated 475 to 565-million-ton coal import requirement for European and Pacific Rim nations.

FOREIGN PROSPECTS FOR ILLINOIS

The sad part of this scenario is that Illinois' present overseas exports are zero (other than a few thousand tons that have been sold on the spot market this year to Japan). One of the chief, or perhaps most overriding, reasons given for this is the fact that Illinois coal reserves are for the most part very high in sulfur content. However, due to the uncertainty with respect to energy supplies in Europe and the Far East, many of those countries are now looking to the U.S., and particularly Illinois, for reliability and

security irrespective of the type of coal so long as it is "reasonably" competitive.

ILLINOIS PRODUCTIVE CAPACITY

My third point then is that Illinois is perhaps one of the most unique states of all coal-producing states in that we have the largest coal companies in the world operating within our borders with the capacity, expertise, and manpower to produce. At present, Illinois coal mines are producing roughly 60 to 63 million tons annually. We have the capacity to produce an additional 12 to 15 million tons annually with our existing mines in operation, and we have six large mines that have been closed over the past two years that could be reopened, providing the market and the means of transportation to that market are available.

I can assure you that Illinois coal companies stand ready and are willing to take advantage of any areas for export, but there will have to be some joint cooperation with the federal government if we are truly to achieve the goal we are capable of reaching. It is encouraging to see that the Congress will address a major problem with respect to coal exports through S. 828, the Ports and Navigational Improvements Act of 1981, sponsored by Senator Johnston of Louisiana.

ILLINOIS TRANSPORTATION

One of our major concerns here in Illinois is that we have the means of producing the coal and transporting it to the Gulf port areas only to find that the facilities required there to handle large exports are not adequate. The above-mentioned legislation would expedite navigational improvements, including dredging, to attain a minimum depth of 55 feet at Mobile Harbor, Alabama, and the Ports of New Orleans and Baton Rouge. This would also allow, to some degree, expanded dock facilities for the handling of coal and other export merchandise.

EXPORT MARKETS

Clarence W. Klassen

My name is Clarence Klassen. I am an Environment Consultant to the Illinois Coal Association. The industry has known for many years that Illinois coal resources are a valuable commodity, both here and abroad. What is apparently new is recent awareness of this fact by our state agencies involved in promoting Illinois products and resources. Today, it requires the translation of this awareness and a new interest into positive action; Illinois has coal for sale, in addition to soybeans and corn. This discussion focuses on potentials for such actions, which to date have been minimal. For example, in the announcement in November, 1980, of the State of Illinois Trade Mission to China and Japan, agriculture, industrial products, science and technology were stressed, but there was no mention of coal, nor was there a member of the mission to represent the Illinois coal industry. It appears we've come a long way since that time, but we still have much further to go.

THE ASIAN MARKET

The availability of coal and its potential export must include all countries, not solely Europe, but particularly the Far East countries and especially Japan, Korea and Taiwan. As a key factor, strategies specifically must include the Illinois Department of Commerce and Community Affairs, and its active recognition and appreciation of the potential of Illinois coal exports. This involves such recognition by the various foreign offices of that Department. Its personnel can play an important role, but requires such personnel becoming familiar with and being briefed on the potentials and uses of this Illinois saleable product and resource. We've heard much talk, nationally and in Illinois, about the importance of coal and its necessary use as an energy source--a maximum of lip service and a minimum of translating this rhetoric into positive action. The coal industry is still waiting for such talk to become a reality.

GOVERNMENT PROMOTION OF COAL EXPORTS

Government offices, both state and federal, through their foreign offices, can play a key role in the export strategy. This includes identifying potential users of coal in their area, cooperating with brokers in their country and keeping the coal producers informed through the Illinois Coal Association of their contact and negotiations for potential demands. However, the coal industry cannot depend solely on government. We are a free enterprise country and we must also develop a working relationship in the "market place" in foreign countries with counterparts in the United States.

PROMOTION THROUGH BROKERS

Such strategy can include what could be termed brokers or agents in foreign countries. These could represent a consortium or

group of coal customers, combining demands and orders and a working relationship with a counterpart person or organization in Illinois in order to "spread" the requested tonnage among those coal producers who have the capacity to supply the quantity and quality needed. The Illinois Coal Association can, and has, acted in this role as a focal point for such demands for Illinois coal. Such arrangements have already produced results. However, the ICA fully appreciates that governments here and abroad are involved in all export operations.

TECHNOLOGY EXPORT VS. IMPORT

Let me say a word about the role of exporting technology to use our Illinois high sulfur coal as part of the possible strategies. The ICA feels quite the reverse may have merit; that is, we should be importing technology, especially from Germany, England and Japan: Processes and equipment in both England and Germany have demonstrated the feasibility of using Illinois coal in conversion processes-- producing oil and synthetic natural gas--and also its direct use as coal in fluidized beds. The ICA, through its members, furnished coal to be exported for such demonstrations. Results have been published. In Europe and Africa, there are commercial-size plants in operation converting coal to liquid and gas. We have no commercial-size plants in the United States, nor any commercial-size demonstration plants.

Also, another type of import is needed--the importation of foreign technology concepts relative to their practical environmental standards, standards that are relevant to the environment to which they apply-- both the physical and economic environment. What we need are standards that are attainable within the state of the art and that are of basic importance at a cost that is economically feasible. Otherwise, as we have experienced in this country and this state, they become a flat prohibition for their attainment--these are but two of several criteria.

Unfortunately, some regulations have contributed to polarizing the industry and government. Success in Japan's industry is a classic example of industry, government and financial institutions working together. Again, to simply repeat, the Illinois coal companies stand ready to work for, and to cooperate with, others, including governmental entities, in achieving goals for coal export, recognizing that such cooperation is not a mere expression of sentiment but is an economic necessity.

METALLURGICAL USES OF COAL FROM THE ILLINOIS BASIN

Michael Holowaty

The experience of Inland Steel Company with Illinois coals goes back to the early 40's. Pressed by the need for metallurgical coal for coke, Inland Steel resorted to the use of Illinois coals from Jefferson and Franklin Counties.

COKING BLENDS

Illinois coal as such is a marginally coking coal and its presence in the coal blends of that period of time resulted in reduction of coke quality. Over the years we developed our own method for coal preparation, tested it thoroughly and increased the percentage of Illinois coal in coking blends to 35%. An Inland-developed flowsheet for coal cleaning was installed at our new mine in Sesser, Illinois, which went into operation in 1968. With this improved Illinois coal, we increased the percentage to 50%, the balance being West Virginia medium volatile coals. The introduction of the coal preheating technology in the 70's allows us now to use up to 75% of Illinois coal in our blend and with the combination of two preheat and five conventional batteries. We are presently using close to 3 million tons of Illinois coal for metallurgical purposes. As we learned more about the properties of Illinois coal, we came to the conclusion that the optimum conditions would be attained if we could produce coke from 100% Illinois coal. The only way we could accomplish this was to produce formcoke.

FORMCOKE

This concept is entirely different from that of conventional by- product coke. Instead of slot ovens usually 18" wide, 20' high and 50' long, the formcoke plant resembles more a refinery with a number of cylindrical vessels and many transfer pipes. The coal is first devolatilized, then the resulting char mixed with a binder produced from its own tar (pitch) and briquetted to any size and shape that might be required. The resulting briquette is then cured, which means hardened, and finally devolatilized in a vertical shaft furnace. The finished coke is ready to be used in the blast furnace in place of conventional by-product coke. At the present time there is one formcoke plant in Kemmerer, Wyoming, which has been in operation for 16 years. It is owned by the Phosphorus Division of FMC Corp. and produces formcoke and phosphorus reduction.

For our blast furnace test in 1973, which was carried out jointly with U.S. Steel, Armco, J&L McClouth, FMC and Inland Steel, we modified the Kemmerer plant to produce high quality 2" sized metallurgical coke briquettes and used 20,000 tons of this material in the No. 5 Blast Furnace of the Indiana Harbor Works. The test was a resounding success and the interest in the formcoke increased correspondingly.

In summary, the basic advantages of the formcoke process are as follows:

1. it can use single coal and almost any Illinois Basin coal can be used for formcoking;
2. it can be located at the mine-mouth;
3. it is environmentally clean; and
4. it can be automated to a great degree.

COKE SUPPLY IN THE U.S.

But now let us take a look at the coke supply situation in the United States through the eyes of Father Hogan of Fordham University, who recently completed a study for the Department of Commerce entitled "Analysis of the U.S. Metallurgical Coke Industry." In this study, Father Hogan writes the following:

> During 1978, for the first time in nearly 40 years, the coke industry produced fewer than 50 million tons of coke, its output of 48.6 million tons falling 14.1% below the nation's consumption of 56.6 million tons. To offset the resulting shortages, consumers turned to overseas source of supply, and coke imports jumped from 1.8 million to a record 5.7 million tons or 10% of U.S. requirements....
>
> The United States was able to import 5.7 million tons of coke because the industrialized nations of Western Europe, as well as Japan, did not experience rates of steel production comparable to those in this country; as a consequence, they had excess coke capacity available.
>
> Dependence on foreign coke does not present undue supply problems when the steel industries in exporting countries are at relatively low rates of operation. However, when their operating rates increase to between 85% and 90%, their coke will be in tight supply, and, if it can be obtained from them at all, the price will increase significantly. During the 1973-74 worldwide steel boom, companies in the United States imported a substantial amount of coke for $125 per ton, which was over $50 per ton more than it cost to produce coke at that time in this country....
>
> A detailed examination of the situation in these countries indicates that a revival of steel-mill operations would make it impossible for many to export coke and difficult for others. Thus, during periods of active worldwide steel activity, when U.S. coke production is inadequate to meet requirements, it would most likely be impossible to fill the void by imports.

Father Hogan then points out that 35% of the existing U.S. coking capacity of 22.4 million tons is over 25 years old. Another 20% of the capacity is 20-25 years old. As we assume the battery life at 30 years, then we can see that our coking capacity is aging very fast.

> It would be well for the U.S. steel industry, with whatever help is necessary from the proper government agency, to examine the possibility of producing formed coke.

> This is a new process, still in the pilot stage, which permits the use of inferior coals and whose facilities are completely enclosed so that pollution would be reduced to a minimum. The claims for formed coke are indeed interesting and are to be seen. However, it is incumbent upon the industry and the proper government agencies to explore the possibilities of building a production-size facility in order to test the claims. If they prove to be valid, a substantial advance can be made in the use of coal reserves and pollution control.

What the Father Hogan study does not report is that much of the coke which we imported from Europe in the last five years and are importing even now was made with American coals transported across the ocean and back again because we have no coking capacity.

EUROPEAN COAL SUPPLIES

In the meantime, however, Europe is running out of coal. There are no operating mines in Sweden, Holland, Belgium, Italy, Spain, or Portugal. The French coal industry is expected to shut down within the next three years. The German and the British have sufficient coal reserves underground, but they are getting to be prohibitively costly to extract.

The question arises: Wouldn't it be a good prospect for us to produce coke in the United States and besides satisfying our own needs, export the coke instead of raw coal to Europe and other countries? If so, Illinois Basin coal converted into formcoke would be ideally suited for such a venture because of its access to the extremely economic river transportation system. The loading and unloading of coke briquettes presents no problem as was established in a 1972 study of the British Steel Corporation with the same kind of formcoke briquettes which we have used in our tests.

The formcoking process has one additional potential trump which I haven't mentioned. The high sulfur Illinois Basin coal could be desulfurized in the char cooling stage, and thus it is conceivable that a 3% sulfur coal could be converted to coke with less than 1% sulfur. However, this will require additional work. How big is the market for such a coke product? I would estimate that it is upward of 10 to 20 million tons/year, of which about one half would go overseas and the other half would be used by our own steel industry. It should be borne in mind that the production of one ton of coke requires almost 1.7 tons of Illinois Basin coal.

Thus, in summary, what would be gained by establishing a strong coking industry in the Illinois Basin is this:

1. we would export a finished product instead of a raw material such as coal;
2. we would create construction jobs;
3. we would create operating jobs in formcoke plants, and additional jobs would be created in the coal mines and in the transportation;
4. we would build giant efficient ports for exporting the cargos of coal and coke;
5. we would create around the formcoking plants industries supplying the formcoking plants themselves and other enterprises

which would use the low Btu by-product gas from the formcoking operations in the production of glass, paper, textiles, etc.; and

6. we would beneficially affect our national balance of payments.

UTILIZATION METHODS

Robert Jackson

COAL AND METHANOL

The simplest way to use coal is to burn it directly. Because it is a solid, however, it can only burn in equipment that burns a solid. It is, therefore, quite unsuitable for burning in a motor car or a truck. When coal is burned, it produces two side effects: it leaves behind ash which has to be disposed of; and it puts into the atmosphere various quantities of contaminants contained in it. Disposal of the ash has been handled satisfactorily for many years, but today the venting of the combustion products of sulfur is no longer acceptable. This problem has been attacked, where required by the addition of scrubbers to boiler stacks, but a more important solution may be the use of fluidized bed boilers.

FLUIDIZED BED COMBUSTION

In these boilers, coal is burned in a bed of solids and fluidized by combustion air; limestone is added to react with the sulfur oxides as they are produced. Until now, the designs proposed have had some size limitations which do not make them very applicable to the utility industry--the largest user of coal. Now, however, considerable progress has been made in the development of circulating fluidized bed boilers which do not suffer from the above limitation.

Three boilers of this type have passed the pilot plant state of development. One of these, following a Battelle design and capable of producing 50,000 lb/hr of steam, is under construction by Struthers for Conoco as part of a heavy crude oil production in Texas. A second, being developed by Conoco Coal Development Company in association with Stone and Webster, has successfully completed pilot plant tests, and work has begun on a 50,000 lb./hr. design for one of Conoco's plants. The third design is by Lurgi and is based on many years of experience on retorts and calciners. A pilot plant is being built and designs are being made for industrial and utility boilers.

LIQUEFACTION

All of these designs can be used at the size needed for utility applications. Their successful development could permit a considerable expansion of the market for high sulfur coal--although not until the end of this decade. The most attractive method for using coal, because the largest fuel markets are for liquids, is to separate the unwanted ash and sulfur as soon as the coal is mined and convert the coal into a liquid. The coal can be liquefied directly by dissolving it into a liquid to allow the nonsoluble ash to be separated by filtration from the soluble part and the solvent, or the coal can be indirectly liquefied by reacting it with steam and oxygen to produce a gas mixture which can be used as feed to a reactor in which liquid is synthesized.

Commercial interest in coal liquefaction developed in Germany with the invention of the Bergius Process in the 1930's. This process involves the reaction of coal with molecular hydrogen at

high pressure. By 1943 the total installed hydrogenation capacity including coal and coal tar feedstocks amounted to slightly more than 4 million tons per year. The hydrogenation of coal and coal tar as a commercial industry ceased to exist after 1945 primarily because it was not competitive with natural petroleum. Although there are very extensive development efforts now underway in many countries to provide a basis for a new and improved commercial coal liquefaction industry, the basic technology involved is still based on the original German developments. A number of processes are under development in the United States such as the Gulf SRC-I and SRC-II, the Exxon EDS, COED/COGAS and H-coal. All of these processes produce a synthetic crude oil which can be refined into products somewhat similar to those that are produced from crude oil today, except that, in general, they will contain more aromatics. Conoco is involved in some of these projects and our subsidiary, Consolidation Coal, has been involved in coal liquefaction projects and investigations for more than 25 years. We have concluded from these many years of research that while these processes may eventually produce alternative fuels for coal, there is much work to be done in many unusual paths before they become commercial successes.

GASIFICATION

Liquids can also be made indirectly today using existing technology in which coal is gasified to make a mixture of hydrogen and carbon monoxide, and from that mixture, after suitable adjustments to composition, methanol, methane, or more complex mixtures of hydrocarbons can be synthesized using well-established and proven processes.

There are three basic types of gasifiers in which coal is contacted with steam and oxygen provides the energy needed for the gasification reactions. The three types are the concurrent entrained phase gasifiers, the countercurrent fixed or moving bed gasifiers, and the fluidized bed gasifiers. While all three systems may be operated at elevated pressure of 30 or more atmospheres, only the countercurrent fixed bed gasifiers, according to the Lurgi design, are presently proven and operate commercially at such high pressures. The commercial example of the concurrent entrained phase gasifier, the Koppers-Totzek, and the fluidized bed represented by the Winkler both operate at atmospheric pressure. Because of the power required to compress the gas leaving the gasifier to synthesis reactor pressures, little consideration is being given to the use of either of these gasifiers in indirect liquefaction plants.

THE LURGI GASIFIER

The most important gasifier available commercially today is that designed by the Lurgi Company in Frankfurt, Germany. It was initially commercialized in 1936 and since then many have been constructed throughout the world. Although some have been closed down due to age or because of the availability of cheap crude oil, the design is still being proposed for many synthetic coal-based alternative fuel plants in the United States, and it is the gasifier used in the very large complexes of SASOL in South Africa. Lurgi gasifiers are high pressure, fixed bed, non-slagging, steam oxygen gasifiers and have a wealth of commercial experience. This gasifier is, we believe, the only one which can be considered commercial

today for the production of synthesis gas although there are a number of new systems which are proceeding at a rapid rate towards commercialization and may become available for second generation plants in the late 1980's.

The first of these is a modification to the Lurgi based on British Gas Corporation technology. This development began in 1955 but was stopped with the advent of cheap foreign oil imports into Britain. In 1974, as a result of the support of a group of companies based in the United States, work was begun in which a Lurgi gasifier was converted to the slagging mode. Since then, this gasifier has run through many tests, some supported by that group and later by the Department Of Energy, EPRI, the American Gas Association, and others. Indeed, one might say that at a level of consumption of coal of 350 tons per day (the size of the experimental gasifier), it could be accepted as commercially proven. In the next stage of the development of this gasifier, British Gas is building a 750 ton-per-day, eight-foot diameter version which is considered to be the largest that can operate using a single coal feed into a gasifier.

Texaco and Shell are both developing pressurized entrained phase coal gasification units. The Texaco process is a development for coal of a commercial process for gasification of petroleum residuals. The Shell process is a development designed to take full advantage of the commercial technology of Shell in pressurized oil gasification and the Krupp-Koppers atmospheric pressure coal gasification. Pilot plants, gasifying 150 tons-per-day, are currently in operation for both processes. A Texaco-based pilot plant has been in operation by Ruhrkohle at the Ruhr Chemie Chemical Complex in Oberhausen-Holten, West Germany, since January, 1978, and the Shell plant has been in operation since November, 1978 at the Hamburg refinery of Deutsche Shell.

There are a number of other gasification processes being developed in the United States and overseas. But these are at an early stage of development or are designed to operate under conditions which are not really suitable for the production of liquid fuel. Thus, if we look toward the production of alternative fuels from coal and we consider liquid as the main product, then the gasifiers that have been mentioned are the ones to be given prime consideration.

At Conoco we are convinced that the only gasifier that can be built and operate commercially today is the dry bottom Lurgi running on western coal, but it seems a reasonable probability that the BGC/Lurgi Slagging Gasifier, the Texaco, and the Shell gasifiers may be demonstrated at a sufficient size for the plants to be considered commercial later in the 1980's. Thus, we must expect that the first commercial production of coal liquids in the 1980's will be based on the Lurgi gasifier. By 1990, a number of gasifiers will be available which will provide an opportunity for eastern coal resources.

TYPES OF COAL LIQUID

What will these coal liquids be? The only large-scale commercial production of liquid from coal today is taking place in South Africa where the Fischer-Tropsch Process is used to synthesize large quantities of hydrocarbon fuels. This process is rather expensive and except where very cheap coal is available is unlikely to be developed further. Much more likely to be developed is the production of methanol. Methanol is produced by synthesis from

carbon monoxide and hydrogen, using proven processes, the best known of which are those developed by ICI and Lurgi. Importantly, they all work effectively irrespective of the source of the synthesis gas, be it natural gas, naptha, heavy oil, or coal.

And why methanol? Methanol can be considered an environmentally benign fuel since it contains no sulfur and nitrogen and, therefore, burns without the emissions of any of the first and little of the second. Because it is a liquid, it can be burned in any piece of equipment which presently burns liquid fuel, and, therefore, we can consider many options for its use. It can be transported through a conventional pipeline distribution system, by railroad and unit trains, and by water if a waterway is available. Thus, methanol can be made almost anywhere in the world and transported to a customer almost anywhere else in the world.

We believe that methanol can be used in stationary engines, particularly for power generation; in agriculture as an alternative to liquid petroleum gas; in industry; and, most effectively, in automobiles. Methanol is a high octane fuel and, therefore, it is possible to construct an automobile with an engine somewhat different to one that uses gasoline. It can have a much higher compression ratio and run on a much leaner mixture, and as a result use 25 to 30% less fuel per mile.

It is difficult to conceive that any methanol will be produced via coal gasification before 1987, and we must expect the buildup over the first few years after this to be very slow. Investors are very wary of putting too much money into a new industry until they are satisfied that the first plants have operated satisfactorily. By the beginning of the 1990's, however, enough operating experience should have been gained to show that this is a satisfactory investment form. We can anticipate that between 1990 and the year 2000 a large number of plants will be constructed. The number will likely be constrained by the availability of A and E contractors, construction workers, and maybe even plant operators. But within these limits, we can anticipate that by the year 2000 there may be between 800,000 and 1,000,000 barrels a day of methanol being produced in the United States.

ILLINOIS COAL EXPORTS

So how can this affect the export of Illinois coal? Because it makes most sense to burn coal directly, encouragement must be given to develop those processes which enable high sulfur coal to be burned directly. Although stack gas scrubbing techniques are becoming available, users generally prefer to burn lower Btu low sulfur coal. Thus, the most important development to encourage the use of high sulfur coal is the fluid bed boiler which I mentioned earlier.

Thus, a simple analysis will tell us that there is a possibility of exporting Illinois coal indirectly by first converting it into methanol. The French government, with the announcement of its Carburol Programme last January, indicated the possibility exists. Other governments in Europe, notably West Germany and Sweden, have been supporting work on methanol as an alternative fuel for some years. Thus, the successful development of a methanol-from-coal industry in the world would develop this indirect method of exporting coal. On the other hand, there may be those who object to this exploitation of U.S. resources in spite of the jobs it could create. Consideration must also be given to the limited capacity of the

construction industry, as I mentioned earlier, which must raise serious doubts as to the availability of this type of resource for the benefits of other countries.

In the short term, perhaps we should invite them to cooperate with us to develop an alternative fuel industry, and for their share of the cooperation, allow them a share of the product. Then, after the successful commercialization, we should hope they will build their own plants and import our coal to use in them. During the time it takes to do this, we must improve our transportation system so that we can have a viable alternative to crude oil based on the world's largest energy resource--coal.

ILLINOIS COAL FOR EXPORT: SOLVING THE TRANSPORTATION PROBLEM

Norman D. Clucas

I have been involved with southern Illinois coal for almost 40 years, first as traffic manager for a coal company and later as a coal traffic man for two railroads. At one time, I handled coal to power the railroads' steam engines. More recently, my involvement has been with unit train movements linking mines with generating plants and other coal-consuming domestic industry.

Through most of the years I've been associated with Illinois coal, the international market has remained a distant phenomenon of little more than academic interest to producers and carriers in this part of the country. Virtually all the coal exported from the United States was metallurgical coal produced by eastern mines and shipped through tidewater ports.

GROWING IMPORTANCE OF COAL

In 1973, however, the world began rediscovering coal as an energy source. Now the international coal market is expanding rapidly, and the new demand is for steam coal. Western Europe and Pacific Rim countries imported 77 million tons of steam coal in 1979. According to U.S. government projections, they will import about 150 million tons a year by 1985, around 250 million by 1990, and perhaps 500 million by the year 2000. Today, Illinois coal is needed on the world market, and each year that need will grow stronger.

The soaring petroleum prices that created the coal boom have already doubled the cost of shipping Australian coal to the major importing countries. South Africa, which has access to almost no petroleum, must devote much of its coal production to domestic use. Poland ships much of its export coal to other Eastern Bloc countries. Increasingly, Western European and Far Eastern coal importers must turn to the United States, and the resulting export traffic is swamping eastern ports. Lines of as many as 100 foreign ships sometimes wait to be loaded at Hampton Roads and other traditional coal ports. While they wait, shippers are subject to demurrage charges as high as $15,000 a day.

U.S. COAL PORTS

Eastern ports are unable to handle the flood of steam coal partly because port facilities simply aren't extensive enough and partly because facilities were designed to handle metallurgical coal. Undoubtedly, expansion and installation of steam coal-handling systems will increase the capacities of East Coast ports, but virtually no one believes the traditional coal ports will be able to handle all the nation's export traffic in the years ahead. If the U.S. is to capture its full share of the world market, midwestern and western coal must be exported through newly developed coal ports. Illinois coal shipped through Gulf ports, and maybe through Great Lakes ports, must account for a large portion of the new export volume. All of us interested in establishing Illinois

coal on the world market face a tremendous opportunity. We also face a two-part challenge.

COAL CUSTOMERS AND TRANSPORTATION CONSIDERATIONS

First we must find the international customers who are able to use Illinois coal. And second, we must develop a transportation package to put the product of the state's mines on ocean vessels at a competitive price. I have no doubt that we can find foreign buyers. We at MoPac have met in recent months with representatives of coal users from Europe to the Far East, and each has expressed an interest in Illinois coal. As the world demand for coal continues to build, and as emission control technology is further developed and more widely employed around the world, an increasing number of steam coal consumers are likely to adopt specifications that can be met by Illinois coal or mixtures that include Illinois coal. I am equally confident a workable transportation package can be put together.

MOPAC'S COAL HANDLING

During our meetings with foreign coal buyers, we describe MoPac's experience in handling large volumes of coal. We point out that MoPac now serves, directly or jointly, 16 mines in Illinois and we are in a position to haul the millions of tons of untouched reserves yet to be mined in the state. In 1979, we carried 18.5 million tons of Illinois coal. Last year, we hauled almost 20 million. Before the UMWA strike, we expected to haul 23 million tons in 1981. We tell prospective international coal buyers that most of the state's mines, and certainly all new mines being developed, are equipped with loop tracks and the many other fast-loading facilities required for the rapid, efficient handling of large volumes of coal. We mention that MoPac serves all the Gulf ports, either directly or through connections.

MOPAC AND PORT FACILITIES

While serious interest in moving midwestern coal through Gulf ports is just developing, we point out that the movement of large quantities of other bulk commodities through these ports is not new. Facilities for handling export grain have been operating for years. In fact, Missouri Pacific hauled more than 18,000 cars of grain to New Orleans for export last year, most of it in trainloads. In other words, we tell prospective international buyers that a large part of the transportation system necessary to meet their needs for bulk shipment of Illinois coal has been in place and operating efficiently for many years. In fact, some export coal has been moving through Gulf ports for the past two years. MoPac has been involved in the movement of export coal to New Orleans through one of the four rail-barge transfer facilities we serve in Illinois. When shipments are transferred from rail to barge, the railroad is normally unaware of the final destination, but we are usually informed when the coal is for export.

PRESENT TRANSPORT CONDITIONS

As is true of any railroad, MoPac tries to secure the longest haul possible. However, to date, we have handled mostly test shipments of export coal and are not engaged in any long-term arrangements. Thus, rail-barge shipments have been the most feasible method of serving customers' transportation needs. Also, facilities for transferring coal from rail to ocean vessels have been limited at Gulf ports. We will continue to serve our shippers as we currently do until traffic volume and facilities for rapid transfer to ocean vessels enable us to offer shippers the best possible direct service to Gulf ports at a rate beneficial to all concerned.

We recently completed upgrading our main line to New Orleans and will soon complete an extensive improvement program on a second line that also could carry Illinois coal south. Because our main line is equipped with centralized traffic control, the two lines actually provide the capacity of three lines. Certainly, we are capable of hauling huge quantities of coal to the Gulf. We are also well equipped to serve producers who may want to use Chicago as a transfer port for export shipments through the St. Lawrence Seaway, and Great Lakes cargo rates are established via Missouri Pacific. Thus, moving coal from mines to ports is not a problem. Improvements are needed at the ports, however.

GOVERNMENT'S ROLE IN PORT IMPROVEMENTS

Some have suggested that federal money is needed to improve port operations. We are convinced, however, that when producers receive firm orders, money will be available in the private sector for construction of necessary loading and transfer facilities. Creation of 55-foot channels so that Gulf ports can accommodate vessels of the size typically employed in coal service also has been identified as a requirement if the Gulf is to become a major outlet for export coal. Such projects are generally agreed to be within government's domain. Just a few obstacles must be cleared to open a path from the coal mines of Illinois to the coal consuming industries of the world. Together, we can clear those obstacles. Together, we can find international buyers and we can develop an effective transportation system. Missouri Pacific is ready. When export coal begins to move from Illinois in volume, you will find us prepared to handle it, however great the volume may be.

CHALLENGES OF COAL TERMINAL OPERATIONS

Gerald D. Cunningham

By now, I am sure that everyone is aware that if we are to take full advantage of the opportunities that exporting Illinois Basin high sulfur coal present, all the players will need to work together to form a continuous chain of transportation and marketing logistics from mine-mouth to end-user. While the Illinois Basin unfortunately contains more higher sulfur coal than most of us would like, it is fortunate to be located in one of the best transportation corridors in the United States. The location of the more than 215 billion tons of identified reserves is ideally suited for easy access to the export market via the Mississippi River and the Port of New Orleans. This coal can use the same rail and water transportation network that has been in place and used for many years by the nation's grain trade.

INLAND AND SEA LOGISTICS

New Orleans, situated at the lower end of the Mississippi River near the Gulf of Mexico, has more direct connections to various types of inland transportation than any other port in the United States. Most ports are connected either by rail or water to inland systems, but not by both. The East Coast ports of Hampton Roads and Baltimore must receive all of their coal by rail and have no access to inland water transportation. This also applies to the West Coast ports and to a lesser extent to the port of Mobile. Mobile does receive small quantities of coal by the Alabama River from local Alabama coalfields, but until it is connected to the Tennessee and Tombigbee Rivers in the late 1980's, Mobile will not have easy access to the U.S. water systems. New Orleans, however, via the Mississippi River, has direct access to most of the major U.S. rivers. This opens up the Midwest coal areas, the Illinois Basin, the Arkansas Basin, and the east Kentucky and Tennessee. This river system provides for these regions barge transportation down to the port of New Orleans for export via the Gulf of Mexico.

New Orleans also links into the U.S. rail system via the Illinois Central Railroad, TPMP, and Southern and South Pacific Railroads that terminate at New Orleans and service a large part of the U.S. coal-producing areas. The East Coast ports are served by rail but only from the eastern coalfields of West Virginia, Virginia, Pennsylvania and east Kentucky. The primary railroads serving these ports are the N & W, B & O, and C & O. The West Coast is not yet a major factor. The only access to the western coalfields is by rail. These connections, as well as adequate port facilities, have to be developed before large movements can begin from the western areas. Overall, New Orleans is better situated than either the East Coast or West Coast ports to take advantage of the various inland transportation systems.

EAST COAST VS. GULF EXPORTS

The economics of exporting coal through the port of New Orleans, as compared with the East Coast and other Gulf Coast ports,

is a function of the mine origin. Our studies have concluded that coal destined for export, produced east of an imaginary line from west Pennsylvania running south through West Virginia and eastern Kentucky, is more economically shipped via the East Coast terminals compared to the Gulf Coast and New Orleans. This conclusion does not give consideration to demurrage costs for either rail or vessels, but is supported by all rail rates from these areas to the East Coast ports compared to any integrated rail-water rate to New Orleans or Mobile. However, beyond this area, the East Coast ports are generally not economically competitive with New Orleans.

The port of Mobile located on the Gulf Coast has economic advantages over New Orleans only when the coal comes from Alabama or east Tennessee origins. Mobile could be more of a factor if and when the Tenn-Tom Waterway is completed, although the new connection limits barge tow sizes. The other major port located on the Gulf Coast is Houston. There are several plans to build coal terminals in that area (Pelican Island and others). This port could be an export terminal for western coals because of rail connections with those producing areas, but it is doubtful that the railroad can produce lower unit train rates in the near future to compete with rail/barge movements to New Orleans. Most western coals in the future will probably move to the West Coast for export through new terminals to the Far East.

By combining both rail and water transportation, New Orleans has definite economic advantages over the other ports for coal origins in the Illinois Basin and Arkansas and some western areas, since a New Orleans coal terminal has the flexibility of integrating rail and barge.

While New Orleans compares favorably to other ports for inland transportation, it does not, however, have that advantage with ocean rates. Our latest information suggests that coal exported from New Orleans and bound for Western Europe is $2 to $4 higher for ocean freight than the East Coast rates when shipped in 60,000 DWT vessels. This differential will be reduced when larger vessels can be used following the dredging of the Mississippi River to 50 or 55 feet. However, present ship demurrage rates at the East Coast ports are in excess of the ocean freight differentials. Therefore, the challenge is to assure the Illinois Basin producers as well as foreign buyers that sufficient port capacity at reasonable cost will be available to complete the chain that is necessary for the successful marketing of high sulfur coal in the world market. To date the problem has been a lack of new and modern terminal capacity at the Gulf Coast. However, private industry has accepted the challenge during the past year with the announcement of several new coal export terminals to be constructed, as well as the upgrading of the two existing terminals located below New Orleans in Plaquemines Parish. To this new capacity we must add the substantial interim capacity of midstream loading that has materialized in recent months. A summary of existing and planned export capacity is presented in Table 1.

Table 1
Export Capacity

EXISTING:

NAME	CAPACITY	EXPANSION PLANNED
Electro Coal	10 MTPY	20 MTPY
International Marine Terminal	4 MTPY	12 MTPY
Burnside Terminals	4 MTPY	--------

PLANNED:

International Matex Terminal	12/15 MTPY	20 MTPY
Ohio Barge Line	11 MTPY	20 MTPY
Peabody Coal	10 MTPY	--------
Freeport Sulfur	--------	--------

Many other firms have shown an interest in either building or participating in a Mississippi River coal terminal. Assuming some of these planned facilities go no further than the planning stages, it is apparent that sufficient capacity will be on stream between now and 1983 to serve the most optimistic projections of coal that would be exported via the Gulf coast.

To make New Orleans a more attractive coal port, we must have immediate action to dredge the southwest pass at the mouth of the Mississippi River to a depth of 50 to 55 feet, which will be essential to accommodate the larger and more economical bulk-carrying ships in the 100,000 to 150,000 DWT class. The economics to be gained from shipping coal in these larger ships ranges from $5 to $8 per ton. Therefore, it is imperative that this project receive the support of all of us if we are to remain competitive with other countries that already have deep draft ports.

We at International Matex have recently announced the construction of a major new coal export terminal to be located at mile-point 46-47 on the Mississippi River about 40 miles below New Orleans. This site is known as the Magnolia Plantation and comprises over 2,000 acres of land with over 2 miles of deep Mississippi River frontage. This gives us the ability to fleet about 180 barges and to handle 15 to 30 large tows intact. Current plans call for the construction of a dock designed to handle ships to 130,000 DWT and a traveling shiploader with a design loading rate of 6,800 tons per hour. A continuous barge unloader with a design rate of 5,000 tons per hour will also be incorporated with a barge cleanout station. By using two-track mounted stacker/reclaimers and additional stackers, the terminal will have the full flexibility to load ships while unloading river barges at the same time. Phase I will provide about 850,000 tons of live storage with an additional 1 million tons of dead storage. Services provided by the terminal will include the

mixing of various types of coal to the customers' specifications while reclaiming from two different piles at the same time. An automatic sampling system is also being designed into the system for quality control. International Matex believes that a terminal should be designed and operated to offer the customer the greatest amount of flexibility.

There are certain benefits accruing to an independent public terminal not controlled by any coal producers or buyers. It will enable more coal producers to participate in the export market without making the large capital commitment needed for their own terminal, and, at the same time, guarantee their throughput needs without preferred treatment of the terminal operator's product for loading during peak times. A customer pays only for his capacity and can trade with others in the terminal as oil companies have done for years. The assets are shared by many companies, while giving each the flexibility needed on an equal basis.

Within the International Matex group of companies, we are prepared to meet the challenges of exporting U.S. coal with extensive local, domestic, and international experience in offering independent logistic services.

TRANSPORTATION TO EXPORT MARKETS

Harold M. Mayer

Several common themes emerged from the presentations of the four speakers at the session on transportation of high sulfur export coal. It was agreed, by implication, that the transportation of Illinois high sulfur coal to overseas markets did not present any insurmountable problems, but that several matters of public transportation policy need resolution if the coal is to be successfully marketed in completion with coal from other sources.

MISSISSIPPI RIVER TRANSPORT

All agreed the principal route for Illinois coal to seaboard will be the Mississippi River system of waterways, along with, in some instances, overland routes to the Gulf Coast ports, especially New Orleans. Therefore, conditions affecting the navigation on the river system are of vital concern.

The mouth of the river, including the several "passes" used by ocean-going vessels, requires constant maintenance by dredging, and the continued availability of dredging service by the federal government must be a high priority. The trend toward larger and more efficient ocean bulk carriers with deeper drafts is eliminating many vessels from direct participation in the export trade in coal from shallow Gulf ports. A deepening of the lower Mississippi to 55 feet was urged in order to eliminate this costly impedance and to permit the larger and more efficient vessels to reach New Orleans and other lower Mississippi points where existing and proposed transfer facilities are, or will be, located.

Competition among the carriers connecting the Illinois coal areas with the lower Mississippi ports will inevitably produce relatively low inland rates. Barges, which now carry a high proportion of coal, must be assured of a continuous minimum channel depth of nine feet above Baton Rouge on the principal rivers, and to have minimum delay, regardless of low water or other unfavorable conditions or congestion in the locks. In this context, several bills now before Congress may change the ability of the barge carriers to transport the coal as economically as at present. The recent imposition of user charges, in the form of taxes on the fuel used by river towboats, represents a departure from the long-standing policy of provision of river and harbor navigation facilities by the federal government at no direct charge to the users. Now that the initial charges are in force, escalation of the charges year-by-year could significantly reduce the ability of the barge operators to compete with railroads, and perhaps, slurry pipelines.

Lockage delays are common, and especially critical is the situation at Lock 26, on the upper Mississippi, at Alton, Illinois, which has been the focus of controversy for several years. Resolution of the policy, in which the federal government would pursue an accelerated program of replacement of the obsolete smaller locks on the river system, would result in expedition of the transit time for barged coal, and consequently lower costs, since the economies of scale of barge transportation constitute a major force in the modal choice of shippers.

Another issue affecting barge transportation of export coal is the possibility that a bill now in Congress may mandate local and

private participation in meeting the costs of major channel improvements, both on the inland waterways and in the coastal harbors.

INTERMODAL TRANSPORT

Intermodal movement of coal is increasingly common. It was pointed out that several of the western railroads have developed rail-barge transfer facilities along the river system, and that movement of western high sulfur coal to the southeastern United States by unit train to a river terminal, and thence by barge, is developing rapidly. Since Illinois is bordered by two major rivers, and the Illinois Lakes-to-Gulf waterway bisects the state, it is in an excellent position to combine the rail and barge modes for coal enroute to foreign destinations through the ports of the Gulf Coast, and especially the lower Mississippi River.

The session had no representatives either of the barge industry or the overseas maritime shipping industry. However, several points were brought out in discussion. One is that the barge industry, given the above problems, is in a good position to meet any demands that may be placed upon it for movement of coal to seaboard ports. A suggestion was made that consideration be given to creation of offshore transfer points for barge-ship interchange, similar to the LOOP terminal at which imported oil is transshipped, with movement of the coal to large overseas bulk vessels by barge, slurry pipeline, or both.

OCEAN TRANSPORT

It is apparent that the ocean movement of export coal, like that of other commodities, will be greatly affected by the maritime policy of the United States. In particular, a controversial issue which will be prominent in the coming years is that of "flag of convenience" registration, especially of American-owned ships. Subsidies are now available, in some instances, to meet the lower costs of operation under flag of convenience registry, and strong arguments for American registry of American-owned bulk carriers are 1) assurance of availability in the event of a military or other emergency, either at home or abroad; and 2) the role of a strong American merchant marine in improving the balance-of-payments situation of the United States.

THE ROLE OF THE PANAMA CANAL

The Panama Canal may be expected to play an increasingly important role in the export of Illinois high sulfur coal, especially to Japan, Korea, and possibly other nations in the western Pacific. At present, the canal is carrying an increasing volume of westbound coal from Atlantic coast ports as well as from the Gulf of Mexico, and delays are frequent, both at the Atlantic ports and at the canal entrances. Alternative routes are under consideration, including another Central American canal and more circuitous ocean routes, such as around South America or Africa. The delivered price of the coal, of course, includes transportation costs, and Illinois coal must meet the competition from other sources. Although European coal is in an increasingly disadvantageous position because of decreased availability and increasing costs of extraction, American

coal must compete in many foreign markets, such as Japan, with coal from Australia and South Africa.

SLURRY PIPELINES

The prospects for overland movement of coal by slurry pipeline arouse considerable interest. Much of the popular concern involves movement of western low sulfur coal, but there is concern that the limited availability of water in the arid and semiarid West may limit slurry pipelines. This would not be a significant problem in the movement of Illinois coal to coastal ports, but dewatering must be included as a cost item, and there are several environmental problems involving treatment at the pipeline terminals. More serious is the need, before coal slurry pipelines can be initiated, for resolution of the problem of eminent domain. Inevitably, the pipelines must cross railroad rights-of-way at many locations, and the railroads, of course, are not enthusiastic about granting eminent domain across their properties to a competing transportation mode.

SUMMARY

There follows a summary of the presentations by each of the four speakers at the session on transportation. Norman D. Clucas (Assistant Manager, Coal & Coke Sales & Service, Missouri Pacific Railroad) emphasized that Western Europe and the Far Eastern nations must increasingly depend upon the United States for their coal imports, and that the eastern ports are not able to cope with the increasing traffic. He pointed out the need for vigorous marketing, as well as low-cost transportation to the ports. He indicated that the Missouri Pacific, as a major railroad serving the Gulf ports, has long carried export grain, and that it is generally prepared to handle increased volumes of coal. He also indicated that the St. Lawrence Seaway may find increased use as an export coal route; the Port of Chicago would then become a major rail-water coal transfer point, as it is, to some extent, now, for domestic rail-lake movement.

Harry J. Bruce (Senior Vice President, Marketing, IC Gulf Industries, Inc.) urged that the railroads become heavily involved in marketing and promotion of Illinois coal. He described the marketing problems of the Illinois Central Gulf Railroad, which is a principal carrier connecting the Illinois coal-producing areas with both Gulf of Mexico and Great Lakes Ports. He also pointed out that, unlike some other sources of coal, Illinois is a dependable source.

Jerry Cunningham (Transportation Director, International Matex Tank Terminals) pointed out that the Gulf Coast presently is deficient in new modern terminals. New Orleans is the natural port for Illinois coal, and the terminal situation there, as well as the lower river channel conditions, must receive attention. Bulk vessels in overseas coal movement tend to have deeper drafts than those in the grain trades, and if New Orleans, or possibly also Houston and/or Mobile, are to become major export ports for coal, the terminals and channels must both be improved. Midstream transfer is a temporary expedient.

Allen Dorris (President, Coal Stream Pipeline Company) discussed the present and prospective situation with regard to coal slurry pipelines. Most of the proposed routes, he emphasized, are

in the West, and he maintained that the pipelines are, or can be, environmentally acceptable. He believes that the pipelines would have little if any adverse effects upon the railroads, and that it may be possible to develop intermodal movements including the pipelines. Pipelining would reduce the need for extensive port improvements as it would be possible to pipeline directly to vessels offshore tied up to "monobuoys".

During the session, Senator Percy announced, by telephone, the successful conclusion of contract negotiations for the first export of Illinois high sulfur coal to Spain. The coal is to be used in the cement plants of that country, the world's largest exporter of cement. Coal movement from Illinois to the Port of New Orleans will be over the Illinois Central Gulf Railroad.

SYNFUELS TECHNOLOGY FOR ILLINOIS COAL

Bernard S. Lee

We all know that Illinois has enormous reserves of coal. In fact, it is not generally recognized that the demonstrated U.S. coal reserves are about equally divided between the eastern and western United States, and that the total Btu value of eastern Devonian oil shale and bituminous coal resources exceed the total Btu value of western oil shale, subbituminous coal, and lignite resources.

TECHNOLOGY AND HIGH SULFUR COAL

Development of eastern energy resources could be easier than western resource development for a number of reasons. The eastern United States has the advantage of the following: 1) skilled manpower pools and manufacturing resources; 2) more water availability; and 3) much closer markets for synthetic fuels. The basic technical problem is to develop processes which will use the high sulfur bituminous coal generally found east of the Mississippi River. This problem can be solved by the development and use of processes which will produce synthetic fuels and recover sulfur as a by-product.

A number of options are available to produce clean gas and liquid fuels from coal (Figure 1). After preparation, the coal can be gasified using steam and air to produce a low Btu gas. This gas, after purification and sulfur removal, can provide a low Btu clean fuel gas with a heating value in the range of 100-250 Btu per cubic foot. A second option is to react the prepared coal with steam and oxygen to produce a medium Btu gas. This gas, after purification and sulfur removal, would be a medium Btu clean fuel with a heating value in the range of 250-550 Btu per cubic foot. This same gas could be methanated to produce a high-Btu gas (950-1000 Btu per cubic foot), which is completely interchangeable with natural gas. Another option is to use the gas as a feed for a Fischer-Tropsch synthesis to produce clean liquid fuels. The gas could also be converted into methanol, which is a desirable liquid fuel. The German-developed Lurgi Process (Figure 2) is commercially available and has been proposed for use in a number of coal conversion plants. However, the Lurgi Process is not suitable for gasifying Illinois coal.

HYGAS PROCESS

The HYGAS process (Figure 3) was developed at IGT with funding from the American Gas Association and the federal government. The process was designed to use all types of coal feedstocks and to produce a pipeline-quality gas completely compatible with natural gas. The coal is pretreated and pumped as a slurry into a three-stage hydrogasifier. Steam and oxygen are introduced into the bottom stage and the resulting hot, hydrogen-rich gas reacts with the coal in the upper stages. The product gas, containing some methane, is purified by removal of carbon dioxide, liquid aromatics, sulfur and ammonia and is methanated to produce additional methane from the hydrogen and carbon monoxide in the purified gas stream. The product is pipeline gas which is completely substitutable with

natural gas. The HYGAS coal-to-SNG process can use any U.S. coal, including Illinois Basin coal. A total of 22,700 tons of coal have been processed in plant operation exceeding 10,000 hours. About 267 billion Btu of gas have been produced, equivalent to 44,500 barrels of oil. Design for a commercial plant has been completed. The COGAS process is another advanced coal conversion system with high Btu gas and liquid co-products, and has been proposed for a plant in Perry County. At this time, plans to build demonstration plants using the HYGAS and COGAS processes have been suspended due to funding uncertainties.

U-GAS PROCESS

Medium Btu gas is another clean fuel which could be produced from Illinois coals. IGT has developed the U-GAS process to provide medium Btu gas for a number of uses. Figure 4 shows the configuration used to produce a medium Btu gas suitable for industrial fuel. One of the advantages of the U-GAS process is that the ash content of the coal is discharged as a dry granular material which would be environmentally benign. The characteristics of the process follow: 1) high conversion of coal to gas using the ash agglomerating technique; 2) capability to gasify all ranks of coal; 3) ability to accept fines in coal feed; 4) simple design and safe, reliable operation; 5) easy control and ability to withstand upsets; 6) production of product gas significantly free of tar and oils; and 7) no environmental problems. U-GAS pilot plant achievements include demonstration of process feasibility, utilization of different feed materials, sustained steady-state operations, the feeding of caking coals directly, and a coal utilization efficiency of 90 to 95%. The pilot plant has successfully operated on metallurgical coke, COED char, subbituminous coal, Illinois No. 6 coal and Western Kentucky No. 9 coal. The U-GAS process can also be used for combined-cycle power generation for electricity generation (Figure 5). Another potentially attractive configuration can produce a synthesis gas for use as a chemical feedstock (Figure 6). The Memphis Light, Gas and Water Division plans to construct an industrial fuel gas plant based on the U-GAS process and has applied to the U.S. Synthetic Fuels Corporation for a loan guarantee. The plant would use 3,100 tons per day of western Kentucky coal and produce 50 billion Btu per day of 300 Btu per SCF of industrial fuel gas.

In conclusion, coal gasification offers a way to produce clean fuels from Illinois coals. A number of advanced processes are available and ready for demonstration. The processes are environmentally benign and their use on a large scale would be a major benefit to the state.

FIGURE 1

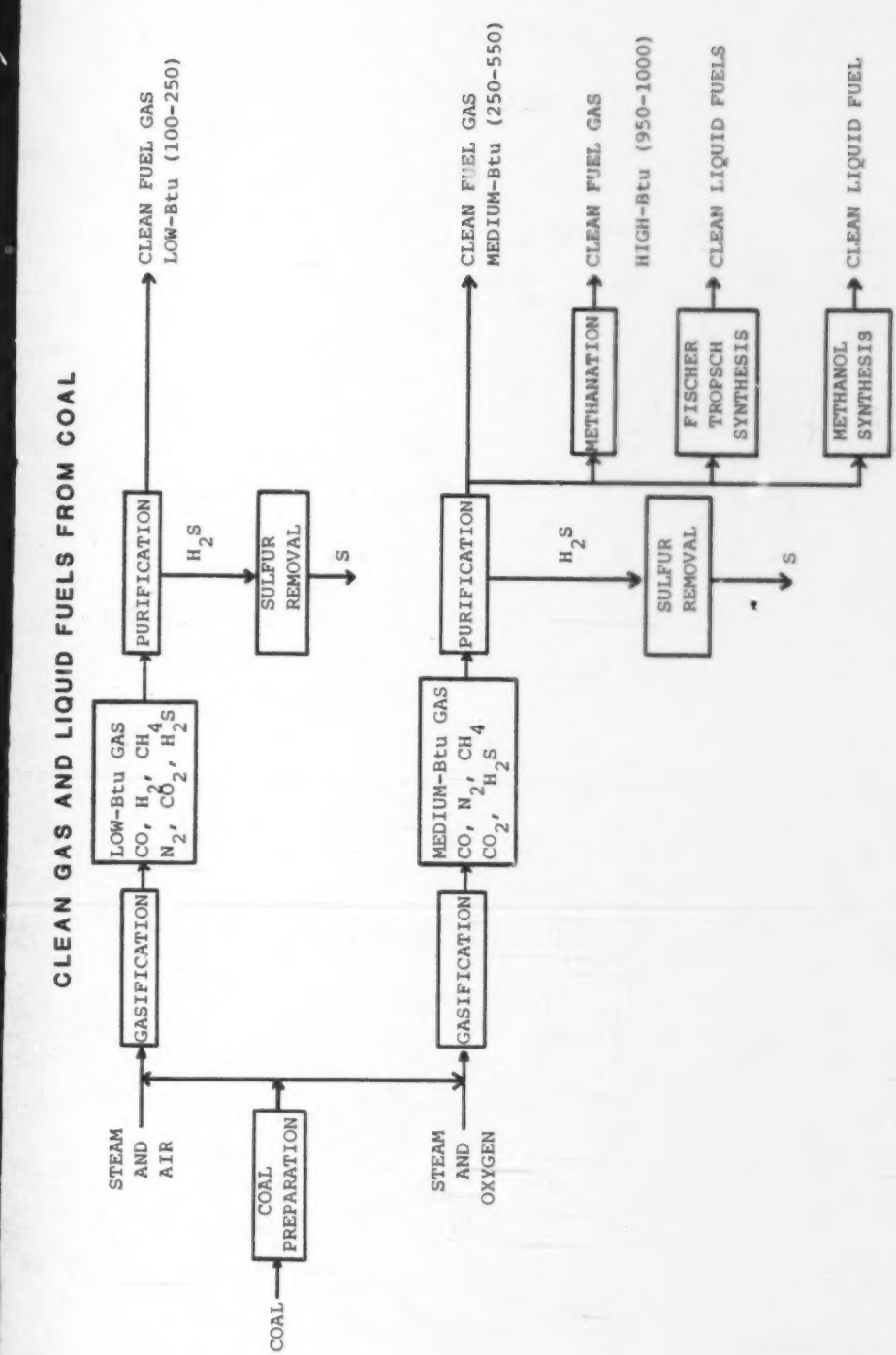

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FIGURE 2

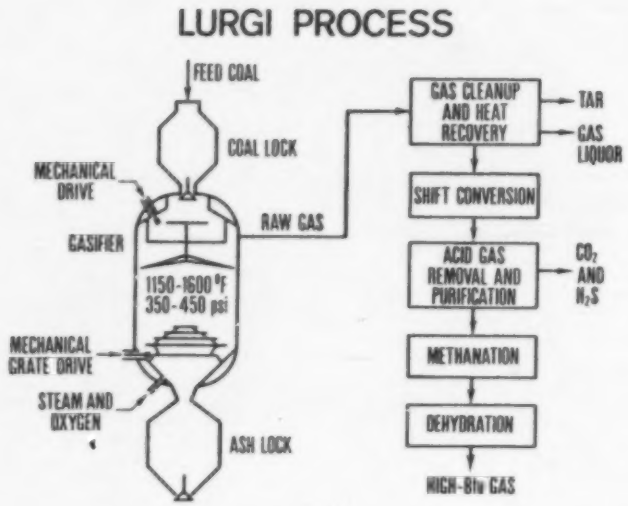


FIGURE 3

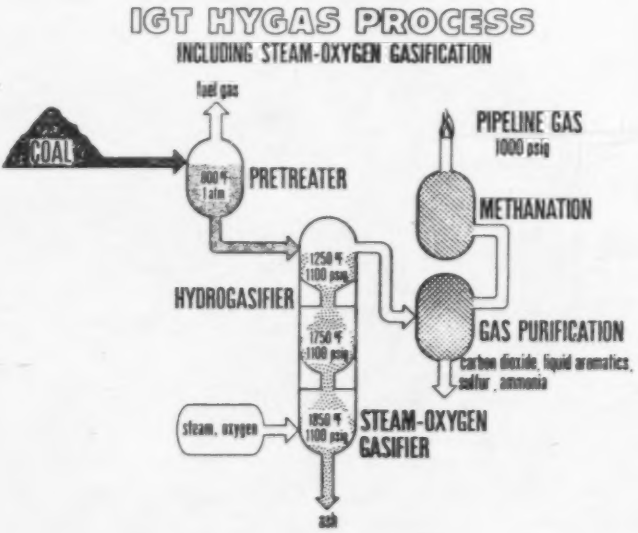


FIGURE 4

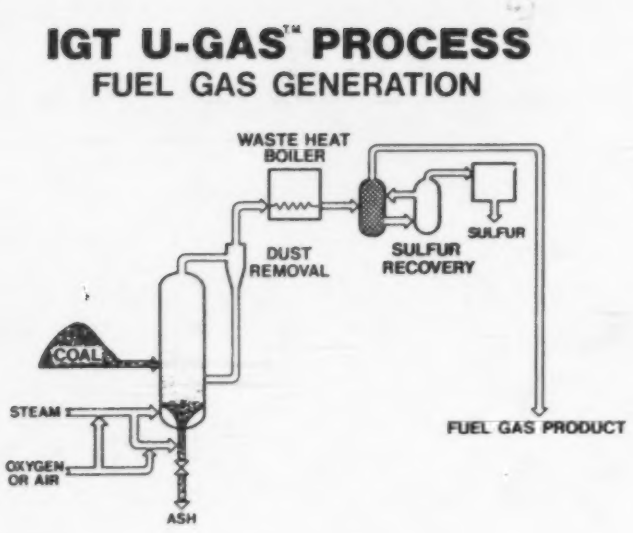


FIGURE 5

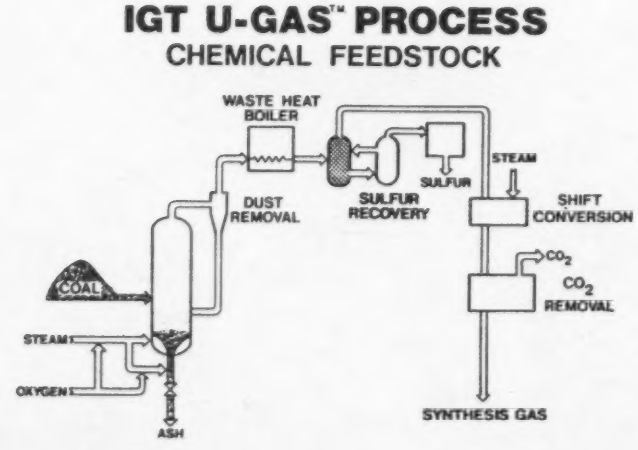
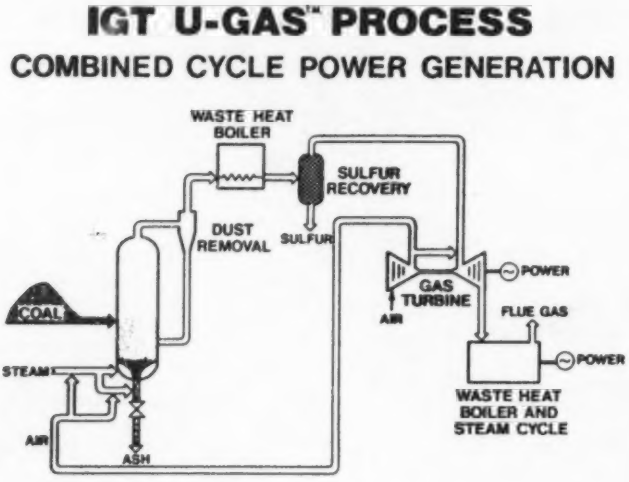


FIGURE 6


IGT U-GAS℠ PROCESS
COMBINED CYCLE POWER GENERATION
WASTE HEAT BOILER
SULFUR RECOVERY
DUST REMOVAL
SULFUR
POWER
GAS TURBINE
AIR
FLUE GAS
POWER
COAL
STEAM
AIR
ASH
WASTE HEAT BOILER AND STEAM CYCLE

CONFERENCE SUMMARY

INTRODUCTORY REMARKS

DR. SENDLEIN: We're really fortunate to have with us Dr. Mel Horwitch from MIT. He's with the faculty of the Alfred P. Sloan School of Management at MIT in the Corporate Strategy, Policy, and Planning Group. There have been references made already to Mel and to the work that he's been doing. He's published quite a long list of articles that I think most of us have seen at one time or another. Mel, we're very pleased to have you with us.

I'm not going to reintroduce everyone else, but there is a new gentleman up here that I have to tell you about. This is Wallace Biermann, Chief of the Research Division in the Illinois Department of Commerce and Community Affairs. Wally did his work at Southern Illinois University and received a degree from us in economics in 1957. He came back to get an MS in economics and education in 1962, and did some teaching and then became a member of the Illinois Department of Business and Economic Development as a research economist in 1970; he's been with state government since that time.

So with that we'll turn it over to Mel and get started.

DR. HORWITCH: Thank you, Lyle. Lyle didn't mention that I have done research in two areas, and maybe this opens up a whole new market for Illinois Basin coal. I've done some writing on the coal industry, and I've also done some research on large-scale technologies, specifically the supersonic transport and the supersonic transport conflict during the 1960's and early 1970's, so it seems to me we have a whole new market for Illinois Basin coal--coal-fired SST's, to bring that together, and that has not yet been brought up today--probably the only thing that has not been brought up. How can I bring it together? I'm not sure I can or even want to.

I'm sure we can't summarize everything that's been said, but I think there are some common things that are worth repeating or worth reiterating so that you go away with some major ideas in your mind, some of the basic themes of the sessions of yesterday and today.

Maybe the most important aspect of this two-day conference is not even the substantive knowledge that has been communicated, but rather the new awareness of the potential and the problems related to the export of Illinois Basin coal. Perhaps this conference represents a beginning more than anything else; and if you go away with just a few ideas and an awareness, maybe we've accomplished a great deal.

In order to further that end I would like to make some statements of my own, express some ideas, Horwitch's ideas of what took place yesterday and today, and then open it up for discussion by our panel leaders of today's session, and Wally as well, so that they can also have some last words or address some burning issues that they want you to remember; and then we can have sort of a roundtable discussion with you people in the audience commenting as well.

COAL AND CHANGING TIMES

What has happened today and yesterday? At a basic level we're seeing a transition, almost a capital "C" change in the coal

industry. Certainly, we're seeing it in the nation as a whole, and probably we're seeing it in the Midwest as well. It's an industry that seems to be in transformation, and maybe before today (since it was not until today that we started bringing everything together) we were unaware that something fundamental was taking place. In the Illinois Basin the industry was once regional, sometimes parochial, and never international in orientation--with practically no metallurgical coal market at all--now this sector is in the throes of change. There is scepticism. There's resistance to change. There's unclarity about the exact nature of the market, the infrastructure, and so on; but I think it's fair to say that this industry is going through a significant transformation and one that will continue.

IMPORTANCE OF GOOD DATA

Another aspect of what has happened yesterday and today is that this transformation is a very complex phenomenon. This complexity is worth keeping in mind. It is so great that it may be hard for any of us to integrate everything we've learned, and maybe we shouldn't integrate it. Instead, perhaps we have to focus on different issues in the areas that we know something about; and so we see complexity in a number of dimensions. In effect, we've taken different "cuts" of the problem. We've put on different lenses, different conceptual lenses. We've looked at resource data--the supply side--in the State of Illinois. We have some idea where the coal is located and of the specifications of this coal. We know where it is in relation to the infrastructure. We know which coal is being mined and where there is potential for further mining.

We are probably less certain on demand data. We have forecasts done by a variety of groups, starting with MIT's World Coal Study, the Interagency Task Force, and a variety of private firms such as the Illinois Central Gulf Railroad.

THE INFRASTRUCTURE

We have also discussed other dimensions of this growing potential in export coal for the Illinois Basin coal area, and I think it's important to keep in mind that there are different dimensions. For example, we talk about it in both the short term and the long term. I think it's very important to decouple the time-frames. We are now looking for short term opportunities and market niches where you can lay a foundation. It's the beginning of a learning period and a product life cycle in a totally new area; but we're also talking about it in the long term (the 1990's through the year 2000).

COAL TECHNOLOGY

We've also talked about technology. Technology has been a very important factor, more important than any of us realize. People have made that point when they've talked about it in terms of the direct combustion of coal, fluidized bed combustion, synthetic fuels, especially gasification or indirect liquefaction, and the formcoke process, which could create a new metallurgical market for Illinois Basin coal. Technology is going, some people say, to

provide, ultimately, the lever to change, to transform Illinois Basin coal so that we can play a role in current low sulfur coal markets. Technology is basically more of a long-term issue than a short-term issue, although we have indications that by the late 1980's we will have low and medium Btu gasification plants on line, and by the 1990's we'll also have effective fluidized bed combustion technologies available.

COAL AND PUBLIC POLICY

In addition, we've looked at the whole issue of business-government relations in relation to the stimulation of the export coal market; and here there have been a number of different suggestions, but the most significant is to remove government regulations that may hinder the development of export coal. Even more important, however, is perhaps the role of government assistance in terms of job training, assembly data in foreign nations, trade missions, gaining resource information, and assisting the private sector in stimulating the export coal trade in Illinois and the Illinois Basin. The State of Illinois and the U.S. Senate seem to be actively involved and want to do more to encourage export potential of coal. In addition, government is playing a role in terms of research and development by sponsoring in a limited way R and D projects in the State of Illinois.

A SYSTEMS POINT OF VIEW

We've also looked at coal from a systems point of view, looking at the infrastructure to find out where the weak links are and to find out where the severe constraints are. Apparently the inland base infrastructure of this region is healthy. In fact, it seems to me there is remarkable competition between barges and railroads today--each claiming to be the better low-cost transporter of coal and touting convincing figures as well to support their respective positions. Who knows which is right? The point is we have the benefit of a competitive, relatively visible, inland-based infrastructure now in the State of Illinois and serving the midwestern coal sector in this country.

PORT CONSTRAINTS

On the other hand, as we all know, there are severe constraints in terms of getting the coal out of the country onto ships, and we have particularly focused on the Port of New Orleans. New Orleans is the gateway for midwestern coal; in fact, New Orleans, from what I've heard today and from what I've seen, will determine how fast the Illinois Basin can serve the international coal markets; and we have reason to be optimistic because of the opening of the public terminal by Ryan Walsh, the stevedore company and the impressive array of new projects that are being planned, implemented, or proposed.

RESOURCE ECONOMICS

We've also looked at resource economics: Can high sulfur coal compete with low sulfur coal in Rotterdam or wherever? Can it compete with Australian coal, South African coal? We find reasons to be hopeful in this respect as well. The economic estimates are at least neutral, and they may be optimistic as well.

All these different ways of looking at coal-business-government relations, public policy, the infrastructure, a systems point of view, technology and economics--bode well for the changing structure of the industry.

IMPORTANCE OF THE PRIVATE SECTOR

One area we have not examined that I would like to spend some time on right now, to put in my own point of view--and this goes further than just summary--is the role of private sector management. I think we have to take a managerial point of view, almost a strategic point of view. Indeed, it's my opinion that the "missing link" in discussing the energy questions generally is perhaps a lack of discussion of the management challenges--the corporate strategic challenges--in energy; and this is especially important in the coal sector, including Illinois Basin coal.

CORPORATE STRATEGY

What do I mean by "corporate strategy?" I mean allocating resources at the top to guide the firm in the long term, to make decisions not just for this year or next year but for the next five years or ten years, to take a long-term point of view. This kind of orientation has been lacking in coal companies for very good reasons, since they until recently had no need or were unable for lack of resources to take a corporate, strategic point of view. But as you know, the coal industry is changing very quickly. It no longer comprises merely a bunch of little companies. It is made up of energy companies, natural resources firms, and multi-nationals with massive resources and significant managerial sophistication. It is time that sophistication, that strategic managerial sophistication, is brought to bear in the coal industry, even for taking advantage of the short-term opportunities in coal. There are at least three areas in corporate strategy that have to be considered.

INTERNATIONAL STRATEGIES

The first deals with the external. You have to gain an idea of where your new business opportunities are. It is important to make a strategic decision if you are going to diversify into exporting coal. If you are going to have global management in the coal industry, you've got to diversify internationally, and then you have to create a structure to do that. I think that such a structure involves creating a division or department--almost an international division or a world trade division--in a coal company, to focus clearly and solely on the international opportunities in coal. In terms of corporate strategic thinking, you first set strategy, then you create a structure to match that strategy to aid that strategy. This is now being done in the coal industry; and by making it

explicit and by recommending it, maybe we can even have it done faster.

This new division has three different roles to play. First it has to look externally and monitor the various export markets. It has to gain useful data and an accurate knowledge of the infrastructure. It has to know the specific users, who the specific users are, and what the major opportunities are for its coal. It has to be knowledgeable about the local channels of distribution and ports conditions in order, for example, to avoid strikes and to avoid political stoppages in an importing country. It has to choose intermediaries that are effective. A chief problem in the coal industry today is that you have people going over to a country such as Italy or Spain and spending a few days there and then returning--all without any sense of real commitment. Each potential importing country will require significant and time-consuming resources. You have to study the specific industries, and have to know local culture, the coal users, their addresses and phone numbers. All this takes time and considerable groundwork. Coal companies will probably need to hire different kinds of people than they have had before--people skillful in terms of multi-national management and commodity trading. This is a big challenge for coal companies, but I think we see companies now that are starting this to a greater or lesser degree.

THE ROLE OF SYSTEMS

A second necessity for a new strategic perspective in addition to these external actions is to monitor the local infrastructure. A systems point of view for understanding the linkages is needed: How can you get your coal from your mine into a barge or train, down to a port, and onto the ship and over to a foreign country? One needs reliable data and very practical knowledge of infrastructure capabilities and the capacities.

INTERNAL SUPPORT

A final key strategic area for an international division or department in a coal company is the internal context. One has to know what one's role is within the firm in which one is working. I think there are a number of different tasks that have to be performed in this regard. One has to have strong linkages with the operating arm of the company. One has to know production--how much you can produce for a specific market. Specifically, one has to have the support of operations. One also has to have the support of one's legal staff and financial staff, and have close working relationships; also, since this is new activity and, given the novelty of the international coal market, I think one needs support from the top. This is a radical managerial strategic innovation and represents significant change in most Illinois Basin firms. Studies in innovation have shown that top support is absolutely necessary and I think it's important that one educates the firm to the opportunities, the potential, as well as to the difficulties of the international coal market.

So there are these three areas that I think are very important for an international spot in a coal firm: an international division or department (that is, knowing the external market), knowing the infrastructure in detail, and knowing where your internal support is

and how much you can depend on the commitment of your firm. There has to be close coordination, and this demands organizational structure and focus.

COAL AND THE CEMENT INDUSTRY

A good example of what I have been saying involves the cement industry abroad. I have recently completed some studies in looking at the export potential for Illinois Basin coal in Italy and Spain; and as people here have said, the cement industry provides a fairly significant near-term niche for this coal sector. Foreign cement companies say that they can use relatively high sulfur coal. Moreover, if you actually go to the major cement companies and talk to the people who are going to be using the coal, the purchasers, and spend some time with them, they will tell you they can use even higher sulfur coal than they say formally. What they have to do is gain experience, and then you can work with them. Once they've gained experience, they may be able to use higher sulfur coal; but coal firms have to spend time with such users.

The cement industry provides, then, a near-term market. It's a way one can learn how to deal in the international environment. Also there's another lesson. I think one has to act quickly in the cement industry. I think there's a foreign window. Cement firms are rapidly converting to coal. The companies that I've talked to, at least in Spain and Italy, say that by the mid-1980's a large percentage of their facilities will be converted to coal so there's an opportunity between now and, say, the mid-1980's for a new market, and I think this is a key way you can go down the so-called "learning curve" in a managerial sense. But I think you have to establish a basic strategy--international diversification in coal, then create an organizational structure to back up that strategy--a very rich organizational structure that can focus on and use at least the cement industry as a short-term opportunity to increase its learning so that eventually it can deal with some of the longer-term issues and opportunities for creating a massive market for coal further down the road.

With that we will turn to our panel of experts who will summarize the conference sessions they chaired or otherwise comment on the conference and hearing.

SPECIAL PROCESSING FOR EXPORT MARKETS

George J. Benda, Jr.

COAL-DERIVED PRODUCTS

MR. BENDA: The session I moderated dealt with developing coal-derived products in Illinois for the international export market; we focused on questions of production and export of methanol and formcoke.

In reviewing the discussions on exporting formcoke and methanol, I have been persuaded by Mr. Jackson and Mr. Holowaty that our first priority should be to develop these refined products for domestic markets. Maintaining domestic productivity and minimizing or at least reducing our imports of oil, and perhaps even coke, in the future ought to be priorities for our country. These considerations ought to be in the forefront of our thinking, though they ought not entirely limit us as we look at international markets for refined coal products.

FORMCOKE

Looking at formcoke, it is clear from the presentation that Dr. Holowaty of Inland Steel made that formcoke technology is here today. It's awaiting demonstration and full commercialization. With the addition of a desulfurization element in the technology, we ought to be able to use that technology to turn Illinois coal--one hundred percent Illinois coal--into useable coke products. The gas by-product is an attractive low Btu fuel for uses in major, heavy industries--any major heat user. Formcoke is promising for domestic coke displacement, and it's also attractive for exports, particularly because of the stability of the formcoke product. I think in many ways many customers would prefer to see formcoke briquettes transported across the oceans than either the rough coke from a normal coke battery or raw coal. Ease of handling should reduce transit costs.

METHANOL

Methanol conversion presents a good possibility for Illinois coal. The technologies are there, though Mr. Jackson was somewhat hesitant to say that we are fully commercial on Lurgi gasification for Illinois coal which is perhaps the most nearly commercial coal-gas system to be used in methanol production. Texas Eastern, through its Tri-state Synthetic Fuels Project, is pursuing exactly that, Lurgi technology. I'm quite certain that Texas Eastern is confident that its commercial plant in Kentucky--which will use Illinois coal--is going to be a successful project from a technological point of view.

THE QUESTION OF TRADE

One of the issues that we didn't raise directly in the session I chaired, but which was raised by my speakers in informal

discussions, was the issue of balance of trade and how that plays into the decision on whether you want to export raw coal or finished products. There are two questions you have to ask in looking at the balance of trade issue. One is, what is the motive of the importing country from its national policy perspective in purchasing a product from the United States--be it raw coal or be it a finished product? If a foreign country wants methanol, why would it want us to have the manufacturing capacity in the United States? Why would it want to buy an already upgraded product when it could conceivably upgrade that product on its own home turf using our coal; that balances against the motive of shipping all that extra weight, all that difficult-to-move product in raw coal, as opposed to finished methanol which would be easy and relatively cheap to transport. On the other side, what motive do we have for allowing high quality products to be exported from Illinois or from the U.S.? If we derive methanol, in particular, we are talking about a fuel that could back us out of importation of foreign oil. Mr. Jackson felt we ought to back out of oil as quickly as we can rather than focusing on the economic gain we might see from exporting methanol. Additionally, as Mr. Jackson ably pointed out, we face scarce resources in this country for developing our synthetic fuels industry--scarce resources particularly in available risk capital, architectural engineering firm capacity, construction capacity and then ultimately in skilled operator capacity. With those scarce resources, we ought to focus on our first priority, which should be backing out of "the OPEC stranglehold," as Governor Thompson said yesterday.

FUTURE PLANS FOR COAL

One point that was not made by my speakers (and here I'll do a little song and dance and sales pitch for the State of Illinois) is that we do have projects which look like they may "go," and these will convert coal to methanol. In White County near Carmi, MAPCO intends to develop a coal-methanol plant that would convert 8 thousand tons of coal a day into approximately 5 thousand tons of fuel-grade methanol. In St. Clair County, Clark Oil intends to develop a plant to convert 5 thousand tons per day of coal into unleaded gasoline, but the intermediary step is to produce methanol. We should be producing methanol and unleaded gasoline from methanol in about 1987 in Illinois. Finally in regard to the Inland Formcoke Project, Inland is hoping to develop a demonstration plant. It looks as if we're going to try to pursue the development of a formcoke plant in Illinois, and we look forward to that opportunity. Thank you very much.

EXPORT OF TECHNOLOGY TO
USE HIGH SULFUR COAL

James P. Hartnett

DR. HARTNETT: Two speakers during the technology session agreed that scrubbing is a transitional technology, and that in the long term it would not be acceptable to the industry. Dr. Lee felt that the shift in the government's position, away from subsidizing high Btu gasification, came as a result of a gas "bubble" following phased deregulation of natural gas. Dr. Lee felt the government action was a mistake because he feels that high Btu gasification is a viable technology; and I might inject this: It might also be a viable technology in Western Europe where they have natural gas pipelines in place, and it may offer an alternative to purchasing natural gas from the Soviet Union; and I think he has another point that we should not overlook, that high Btu gasification may indeed be a technology for export. Dr. Lee also pointed out that even if you ignore high Btu gasification, medium and low Btu gasification processes (which are still being pursued) are also technologies for export. The medium Btu gasification technology also has built in the potential for methanol as a consequence of the indirect liquefaction process, which at the moment appears to be economically more viable than the direct liquefaction process.

LOW BTU GASIFICATION

As for low Btu gasification, Dr. Lee points out that that may well be the way to go for electrical power production; this was emphasized by Dr. Peterson, who gave us a specific example of a technology to use Illinois coals and Eastern coals to produce low Btu gasification, which is the fuel for producing electrical power; it seems to a number of people in the utility industry that this may be a more rapid way to go toward satisfying the environmental constraints than continuing to try to get scrubbers to work. For example, Allis-Chalmers has had considerable success in finding a number of utilities which agreed that that indeed is the case. As far as the export potential, Dr. Peterson pointed out that if one looks at Japan--and I would add Korea as another short-term potential--should the U.S. Kilngas process move, it seems to me that we have a possibility both for the retrofitting of existing oil burning power plants as well as for new power plant construction, phenomena which could well assist in increasing the saleability of Illinois coals.

PUBLIC POLICY

We did not talk about the fluidized bed combustion system, but I do want to bring that up as another viable technology, although it probably is somewhat more distant on the horizon. Dr. Lee's opening statement relative to the government's backing away from coal high Btu gasification brings up a major point in all of this, and that is that the coal industry in this country has suffered because of uncertainty in government policy; the question is whether or not we will have the same elements present in dealing with the overseas potential if there are substantial uncertainties. For example, as Dr. Mayer pointed out, we don't have a transportation policy. If there are uncertainties in government policy that will affect our

overseas potential, then we may be in for trouble because if there's any way for the government to step in and screw things up, it will.

Now, as we look at the international market, let's not forget that our national market for Illinois coal is in jeopardy today as a result of the evaluation of the Clean Air Act amendments, and they could be shifted tomorrow by many a term to eliminate the requirement that western coal be scrubbed; and if that happens, then our indigenous markets are in serious trouble. Do we have a fallback position? We ought to be fighting that battle simultaneously so that, if they do eliminate the requirement on scrubbing western coal, we say, "Well, give us a break on the scrubbing of Illinois coal consistent with the Clean Air Act."

So I point out that while we're looking at overseas markets, let's not forget we do have an existing domestic market. Let's try to protect it.

DR. HORWITCH: Jim, I just want to ask you a question. It seems to me that the history of coal policy and energy policy as well has been changed. We've gone through all kinds of cycles--coal, synfuels, and so on. My opinion is that we're never going to have consistency or certainty. We may go through another set of cycles as well, and I think I just want your reaction to this--I think we're going to have to make some strategic decisions and commitments. I mean, if there are some coal companies that really believe in the export potential of the Illinois Basin coal in the long term or in the short term, and if they believe that new technologies at some point will solve the problems, I think these must realize that there's always going to be uncertainty; and at some point they're just going to have to "bite the bullet."

DR. HARTNETT: I would agree with you. Let me point out, however, that as you yourself mentioned, the future is determined by a number of factors. One of them is policy, and policy can either put you in business or take you out of business; we could be out of business tomorrow with respect to Illinois coal in this country if we're still required to scrub it to the same extent as we are under the Clean Air Act amendments, and if western coal does not require scrubbing.

Now there's no way you can defend that on the basis of either public health or on the basis of economics. It's defended only on the basis of public policy, that you want to keep the people in the eastern region working. That is a factor that we do have to bear in mind; but at the same time, one has to have a backup position. Suppose western coal does not have to be scrubbed; what position do we have in the state? What actions are we proposing to take, political actions? This is a political action. We need to take political action in return.

DR. HORWITCH: I do think that brings up the point that you need creative management in this area where you have to form alliances with different people in the infrastructure--coal companies, court authorities, railroads, people in state government, managing stakeholders.

DR. HARTNETT: We had it, and it's name was Bobby Byrd but we don't have it anymore.

DR. HORWITCH: On that note, we'll go to David Boyce who will offer a summary of transportation factors.

TRANSPORTATION TO EXPORT MARKETS

David Boyce

DR. BOYCE: Thank you. Let me continue this discussion on public policy because as I look at the results of the transportation session, it seems to me that there are some key public policy decisions, particularly at the federal level, that will be made one way or another either by action or inaction in the next 1 to 2 years; and as I look around the room, I see that all our high-powered luncheon speakers have gone back to Springfield; and I see some of my friends at the working level are still here and interested in what's going on, and I guess we have to depend on them to get the message back to their bosses (and to the Lieutenant Governor and his code-evolvement council and so forth) that the Illinois congressional delegation needs to take a strong position on some matters of particular importance to this state in the area of transportation.

DREDGING THE PORT OF NEW ORLEANS

It seems to me that the first of those which is absolutely crucial to any large-scale export evolvement is the dredging of the Mississippi River in the Port of New Orleans; without the economy of scale that we obtain from larger ships that might use that now-shallow port, we will not be able to achieve the kind of expansion of exporting of Illinois coal that we're looking for. I'm not at all sure from my experience that the congressional delegation will understand that issue. They will see that as a New Orleans issue, a Louisiana issue, a Sun Belt issue--and say, "What does this have to do with Illinois?" I'm very much concerned as to how that message will get through.

THE SLURRY PIPELINE

The second issue, which I really didn't think would come up at this conference (but I'm pleased that it did and not because I'm a proponent on either side of the issue but because I think the issue should be resolved in some objective way), is the slurry pipeline issue. I really feel from my conversations with state officials, with the Secretary of IDOT, and with his public policy chief and others, that many people don't know what they think about the slurry pipeline. This is a proposal that's been around for over two years, but state officials are not informed at all about it. It's a very important decision with regard to this state as to whether eminent domain is granted for slurry pipelines. I think that the importance of the decision is not what it will do to the transportation sector, but what it may do for the coal industry and the economic development of this state. In the case of transportation, my general attitude is that we have to let the chips fall where they may. If it hurts the railway industry, that's something that we're going to have to be concerned about; but we should not exclude one mode in order that another mode can continue to prosper or continue to serve us. If there's a better way, we need to take advantage of that better way and then worry about what to do with the mode that's impacted as a related issue.

We're doing some work at the University of Illinois with the support of the state on the coal slurry pipeline issue. The work has just gotten underway. I'm not at all sure that it's going to be done in time to impact on the question that is going to be before Congress this year, but I hope that it will be; and I hope that you can get the message back that this is an important issue to Illinois. It's not a western issue. It's probably, in my opinion, one of the most viable pipeline proposals and the one that will allow Illinois to export its coal to other parts of the country and possibly to other parts of the world.

THE USE OF SCRUBBERS

The third issue that I'd just like to mention because it was emphasized so much by our dinner speaker last night is the question of the Clean Air Act. I know less about this, but I find in listening to what Carl Bagge had to say and what other people had to say that the facts or the views he expressed don't square with the facts as I understand them. Illinois coal producers have benefited from an expansion of their market in the Southeast in areas in which scrubbers are being used on Illinois coal. Illinois coal is the attractive coal for the Southeast for new power plants. I don't think that point is very well understood. I didn't have a chance to talk to Carl Bagge about it. I didn't really want to confront him with that because clearly he has a lobbying activity to carry out, and he may not want to know what the facts are in a sense; but I do feel that this is an important issue and that the Illinois congressional delegation needs to be informed and will be informed through some earlier research we did as to what the case is with regard to Illinois coal and its use in generating stations which have scrubbing equipment.

PUBLIC POLICY AND COAL

There are other things I can report on from our panel, and perhaps I'll interject those later in the discussions; but let me just leave you with this major concern as to how sentiments from this conference are going to get out to the public decision-makers; and as much as I agree with your concerns about the private decision-makers taking action, there are some critical public decisions that are going to have to be made, and unless they're made in the interest of the State of Illinois, I'm very much concerned that we will not go forward in the way we hope.

DR. HORWITCH: Thank you very much. I think that this goal of changing perspectives and increasing awareness, while diminishing parochial views, is very important. I think it's well taken generally.

Let us turn next to Dr. Bhagwat's summary.

PRODUCTION CAPABILITY AND RELIABILITY FOR EXPORT OF ILLINOIS COAL

Subhash B. Bhagwat

DR. BHAGWAT: Let me summarize in a couple of sentences what was said by the three speakers in my session. Dr. Damberger gave us a review of our coal reserves and told where and of what quality they are in Illinois; and in one sentence the conclusion was that we have "plenty of coal." The second speaker, Clarence Klassen, said that we have the capacity and the willingness on the part of coal mining companies to produce as much coal as might be demanded by the market; Kent Garner said that our prices on a delivered Btu basis are competitive in the international market.

Fine, that looks very nice; and you might ask the question, "Why haven't we developed an export market so far?"

Number one, up until about a year or two ago, there was no export market for steam coal, or virtually none. This is a phenomenon that has developed in the last two years or so with the booming demand for steam coal.

Second, coal is no exception to other international trade. Any commodity that has to be successful in the international trade generally has to be successful at home first. We cannot really say that Illinois history of the last ten years has shown that we have kept pace with the production of the entire United States; that doesn't mean that we have to wait until we succeed at home. I think we ought to follow at least a two-pronged strategy.

This session is entitled "Strategies for Developing the Export Market." First, I would like to come back to what has been said earlier: "Find the niche and make use of it." Sell the coal where it is immediately acceptable. We heard that such markets are not many, although the cement industry seems to be one.

CEMENT AS A CHIEF MARKET

Now, if you look at the world cement production of last year, which is about 900 million tons, and set that in a ratio of what energy is needed (the equivalent of about a barrel of oil to produce a ton of clinker) we come to something like 300 million tons as a potential market in the cement industry worldwide, provided everybody is using coal only as fuel. If we keep to our Illinois share of world production at this time, which is about 2%, we could say that approximately 4 or 5 million tons is the market in the cement industry that Illinois could supply, provided we keep up with all our competitors. This is not much in the long run; but if we see that 4 or 5 million tons is about one-fifteenth of what we now produce, it's a good start, and I believe we have to make use of whatever niche we find in the world markets.

In the long run, I'm afraid we have to make every effort to offer our coal to the customer here and abroad at such a price that he can afford to use whatever technology it takes to make it environmentally acceptable in use and still not be more expensive than alternative sources of fuel.

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SUB-STRATEGIES FOR SELLING COAL

The second aspect of the strategy brings us to various sub-strategies which my colleagues here have discussed in their sessions, such as the field of coal cleaning, coal-use technology, transportation, and legislative aspects of coal use, as well as coal mining. I'm rather surprised that the mining aspect of this whole venture was not really touched upon by the speakers in the two-day sessions. The cost of mining coal accounts for the largest single chunk of the delivered price of coal, and any success on the mining front will have the greatest impact on our competitive position. In fact, I think we are obligated to be far ahead of other states in terms of a mine's productivity just to be equal with them in the market.

TIMING OF COAL SALES

A third aspect to all this is time. We have to move fast because port congestions as they are seen on the East Coast will not last forever. Actions are being taken to remedy that situation. Western ports are being developed, and transportation means are being developed to carry western coal to the West Coast. New coal producing countries are coming up in the market, Colombia, for example, and if we wait too long, we may miss both the boat and the train. We have to get our foot in the door and do that fast.

I think that summarizes my thinking on that. Thank you.

ILLINOIS' NEW COAL INITIATIVES

Wallace W. Biermann

MR. BIERMANN: I didn't have a session to report on, so I will just make this brief comment. It is interesting that the luncheon sessions were addressed by the public sector; but when it got down to the nitty gritty of the work and the details of the sessions, it was essentially the private sector that participated and furnished the experts.

We did, however, get the public sector here to listen to the experts. They may not have stayed until the end, but they were here; and these proceedings will be in print, will be made available, and it will pretty well be left up to you and me to see that the public officials do, in fact, become aware of these issues and act responsibly with respect to them.

COOPERATION AS KEY TO SUCCESS

The luncheon session, I think, emphasized the cooperation, and I think this whole conference has epitomized cooperation. It's been the theme throughout. It's cooperation between the public and the private sector. It's also cooperation among the producers, the transporters, the marketers, those with technology, and all of the rest who have reported here today and yesterday.

INTERNATIONAL PROMOTIONAL EFFORTS

We at the State level are doing this. The Council on Coal Development is a result of an effort to get the agencies of State government together to act responsibly, to be informed, to formulate strategies, to look at this international diversification, as Mel Horwitch called it. Although Director John Castle, was not able to attend the first two sessions, be assured that we were represented there, and that we are participating very actively on that Council.

Our department really takes a rather indirect route to coal development. We do not have, as such, coal marketing experts, for our principal activity has been concentrated primarily in manufacturing. We have three marketing specialists in our Chicago office. And three more overseas. One is in Hong Kong, one is in Sao Paulo, and one is in Brussels. We sent communications to these representatives overseas to determine what their impressions are with respect to the international market for Illinois coal, and I would like to share with you some of their responses.

Bart Smith, our man in Brussels, replied that there is a good demand for American coal; unfortunately, most of it is for eastern coal; by "eastern" in this conference I was somewhat confused because eastern coal, I guess, generally includes Illinois coal, while Bart, I'm sure, meant eastern coal in terms of West Virginia and Pennsylvania and places more accessible to the European market.

Henry Smallwood, our man in Sao Paulo, replied that he had never received inquiries concerning coal, but that it would be timely for us to begin to pursue this market.

Dale Berg in Hong Kong replied that he has only worked on one coal trade lead, and that involved Amax and its sale of coal to Japan. I believe that sale was reported in the press in this country as being 900 thousand tons; but in talking to Bob Major of

the Amax Company, he replied that the sale was for only 90 thousand tons.

I think these responses illustrate a point, and that is that we have to be aggressive with the issue. We can not sit back and wait for the European and Asian markets to approach us saying, "We want to buy your coal." We must take the initiative and, from the limitations that appear to be very crucial to our energy supplies, sell to the market. It has to be a concerted and cooperative effort. The state must rally its resources to sell coal and the private sector must also rally its resources. We anticipate working with the private sector whenever and however we possibly can.

The U.S. Department of Commerce is doing some of the same things that we are doing at the state level. They also have an export council on coal structured very similarly to our own. Efforts are directed at trying to get the federal agencies of government together to function in a cooperative fashion. They are preparing market profiles on specific countries, defining particular markets for coal and determining the requirements of each demand sector. They are also in the process of putting together export contract lists of both buyers and sellers. They want to know exactly who's interested in buying, and who's interested in selling so that they can help establish a market.

A final overview comment on the conference is this: In trying yesterday yesterday and today to listen for action words, I must say that they were all "positive." It's very easy to be negative, and to a large extent in our business community we have been identified as having a bad business climate. I'm glad to see that the participants of this conference did not perceive an unfavorable coal export climate.

Some key words which deserve special attention include "opportunity." The participants saw coal in Illinois as an opportunity. Another key phrase was "building bridges." We're going to link the buyer and the seller. We're going to bridge this gap that exists. Another was an "awareness program." We need to educate people, tell them exactly what's wrong with our coal, help them adapt our coal so that it is usable for their purposes. Another key phrase was "change." We must change. Things never remain the same. You can't go back and have the same kind of coal policy we had last year or ten years ago. It has to be new. It has to be ongoing. It has to be dynamic. Finally, the key phrase today was "where the action is." Illinois and its coal deposits are where the action is. I believe it is, and I think with that kind of attitude we can sell Illinois our coal.

DR. HORWITCH: Thank you very much. Lyle, do you have some comments?

DR. SENDLEIN: Why don't you ask some of the others. I can make a few comments, but I'll wait. Let's get some interaction from the group at large.

DR. HORWITCH: Do you people in the audience have any comments you'd like to make?

SEVERAL KEY QUESTIONS

SPEAKER FROM THE AUDIENCE: I have one little comment to Dr. Bhagwat on coal use in the cement industry; the normal ratio of

coal use in cement is approximately 120 kilos per ton. I think your number was expressed in barrels of oil; and of the European market for cement, I personally would estimate that there are probably fifteen million tons of high sulfur coal which could be used if the question of high volatiles in Illinois Basin coal can be resolved. This means teaching European importers how to use it, subject to a listing of the environmental regulations.

DR. BHAGWAT: The number I mentioned about energy use was expressed in terms of barrels for simple understanding. I think my number was 5.2 million Btu per ton of clinker; and if we take a 22 million Btu per ton of coal, one-eighth of that is, of course, slightly less than that. I'm not able to refute that or confirm that; but if I take your number, the total demand will be lower than what I anticipated, probably two-thirds of what I said. It still remains an acceptable niche in my eyes even if we go down from 4 million tons to 3 million.

SPEAKER FROM THE AUDIENCE: But I think the share of Illinois Basin coal can be substantially larger than that.

DR. BHAGWAT: It will be larger if we market our coal in a more aggressive manner than other competitors do. At this time our share of world production is 2%, and I assume that we will be able to keep that share; that itself will be quite a success.

SPEAKER FROM THE AUDIENCE: The point is that the cement industry is converting from oil to coal. I think your percentage of the coal-fired cement industry may be substantially larger than what you said.

DR. BHAGWAT: I did not take into account the cement industry that is already using coal. A part of the 300 million tons I calculated is, of course, already bound by other coal deliveries, and probably two-thirds of that is available for conversion from other energy resources to coal. I'm not sure about the percentage, but I'm quite sure that a part of it is already given up.

DR. HORWITCH: I think this is interesting to debate, but it's not clear that we can resolve the exact numbers here anyway. One thing that is worth saying (at least this is my experience with the cement industry) is that there's great variation in the ability of cement users and in the experience of cement users in using coal. The more experience they get with coal, the more risks they'll take in using different specs in terms of the coal; and in terms of marketing the coal, I think you have to work with the users. You have to set up strong linkages with the users and work with them in using coal with different ranges of volatility and sulfur and so on, or at least this is my experience; and there is a great variation among cement users, especially in Spain and Italy, as we discussed in some depth.

DR. BHAGWAT: I would like to say one thing, however, that nobody will be happier than I am to see that Illinois' share of the coal-fired cement industry is larger than anticipated. I'll be happy to see that, of course.

DR. HORWITCH: Any other comments?

SPEAKER FROM THE AUDIENCE: In terms of technology, has anyone investigated the possibility for hydrologic mining of Illinois coal with the idea in mind that this could be a fully integrating hydrologic slurrying pipeline system? If so, what would this do to the cost, since mining cost is a very large part of production cost?

MR. BHAGWAT: Hydromechanical mining, as it is called, is a Russian invention. It is being tried in a West German mine, the complete mining and transportation as a mixture of coal and water. This has not been tried here as far as I know. There are problems of dewatering, depending on what kind of use we are talking about. If it is a utility use, it can be used; but if moisture content remains high, it can substantially lower the Btu content. It certainly is an interesting concept to examine in connection with slurry pipeline transportation.

DR. HORWITCH: Yes, sir.

SPEAKER FROM THE AUDIENCE: I have two questions for you, Mel, in terms of what you said about corporate strategic planning. First is that your thesis takes into account the very large companies, but some of the producers in the Illinois Basin are small companies. Do you have any particular recommendations in terms of how they can in any way tap that?

Second, you ran through a list of responsibilities for middle management for corporate strategic planning, two of which included avoiding strikes and avoiding unions. Could you expand on that?

DR. HORWITCH: Let me take the second one first. I didn't mean avoiding unions in the United States, although it would be nice if we could avoid strikes. I meant that in ports in foreign countries work stoppages and strikes are very frequent and normal, and many unions are connected closely with political parties. Yet people who have had experience in trading in foreign countries (in Spain and Italy and Africa and all kinds of places) are some of them very knowledgeable in dealing with political labor issues. It takes a different set of skills and experience than most people in this country have, especially in the coal industry; and what I meant by that is that one has to choose very carefully one's business associates so that you gain this expertise. For example, if you're going to Barcelona, Spain, and you know there's a strike there, you can go down to Valencia or somewhere like that and unload the coal. You have to make these kinds of decisions. Therefore, you need people who know that and who know what to do. That's the kind of knowledge you have to have or if you don't have it, you have to get it by proxy, by hiring or subcontracting people who do have that knowledge.

I think the other point that you brought up is a very, very interesting point. I guess that I am saying that in order to play in the international sector, at least right now, you need a certain number of resources. You have to carry a certain level of overhead in a way that you don't if you're just selling coal domestically and playing it close to the line. I think that basically this means that large companies have an advantage, at least initially, because they can support this overhead. Their parents may have operations overseas that they can use. They can tie into that. Plus, they have a longer term perspective. They may have the financial wherewithal to wait out the storm--the vagaries of public policy being a good example. You see this in coal. Synthetic fuels is another

area in which you see it, where the big players are sort of in there for the long term. I think the same thing is true to a lesser extent with coal. On the other hand, maybe the role for the smaller producers is somehow to link up, form consortia, and become part of a larger package, and take a smaller piece of the action. There may be creative or structural things that one can do to become part of a larger group. But I must say too that I think it's no accident that the first announced sale growing out of this meeting--that of Freeman Coal to Spain--involves a subsidiary owned by a giant parent, General Dynamics.

SPEAKER FROM THE AUDIENCE: With regard to that last portion of the question you were just trying to answer, as a matter of fact, legislation does exist. It's called the Webb-Pomerene Act, which allows a firm of any size to join an association for export purposes, exempting it specifically from antitrust provisions, and allowing it to set prices and negotiate on behalf of all the sellers. I don't know that it's being used, but it's there.

DR. HORWITCH: I think this goes back to that other issue, that you need a creative manager to link up people that can help you. Thank you very much.

SPEAKER FROM THE AUDIENCE: To expand on that point, there's also legislation that's in the process of going through this year that would expand the possibilities for export holding companies and that would allow for the first time banks also to become involved and lend their capital.

I'd like to make a couple of other comments before Lyle speaks, and I'd like to commend him and his staff here at Southern Illinois University and Senator Percy's staff and the Senator himself for putting this conference together; and I'd like to comment on something that Dr. Boyce mentioned. I'm on Congressman Paul Simon's staff. I think the word on New Orleans has reached delegations out there. I know Paul is aware and I think it's safe to say that Senator Percy is certainly aware that the New Orleans Port is not just a Louisiana issue. We have been in contact with the Louisiana delegation and the Maryland and the Virginia delegations, and I think you'll see legislation emerging from this congress that will address the dredging issues, and that some sort of user-fee system will emerge; we'll have some progress.

Also, I have one other comment, on Dr. Hartnett's reference to the Clean Air Act. Congressman Simon was on the receiving end of one of those blasts yesterday, and I think he's taken the correct approach: Whatever our personal views are on the Clean Air Act, the reality is that we're going to have to live with what we have; and I think the longer we hold out the hope of an easy solution through the repeal of those regulations, the longer we postpone the hard work that . . .

DR. HARTNETT: You missed my point. I'm not asking for a repeal of the regulations. I'd be personally content to live with what we have now; but what I'm saying is if indeed the Clean Air Act amendments are opened up, and if indeed you eliminate the requirement that western coal be scrubbed, that is not leaving the environmental constraints where they are now. If that does happen, then what is the fallback position that the Illinois Congressional delegation is to take?

SPEAKER FROM THE AUDIENCE: I think you're right. The new source for performance standards and the prevention of significant deterioration provisions were, as you correctly pointed out, political formulations designed to prevent one region profiting from pollution over another, and I think you'll see our delegation, and certainly Congressman Simon, opposing changes that would remove those protections between regions.

DR. HORWITCH: Thank you. If somebody has a burning issue that he or she wants to bring up, I'll take it quickly. Any burning issues?

Well, in that case, I think we've seen here that there is an increasing sophistication; and I mean by sophistication, an understanding of all of the dimensions of the issue of increasing the world coal trade in the Illinois Basin coal sector.

One thing that comes out of this is that we need variety and many diverse approaches. We need macro- and micro-approaches, public policy, and especially, I think, corporate strategy. We need to work on the infrastructure; and I think the people who have organized this conference have to be complimented for understanding that variety is important, maybe even more important than consistency in this regard; that is, one must have a number of things going at once.

One final point is that management training is another issue that is important. We talked about such job training at lunch. I think executive training, management training, and having people understand the possibilities of linking together might be very important for small companies as well; and I think there's a role here for universities to play.

Overall, it seems to me that what we've seen is the beginning of something; the question is, as we point out here, what to do next, how to get this information to the right people. There are a number of ways of doing it. It's the beginning of something, and I can only hope that it will continue; and I think the conference organizers should be complimented. Thank you very much.

Lyle, you have the last five minutes.

SUMMARY COMMENTS

Lyle V. A. Sendlein

DR. SENDLEIN: All right. Thank you, Mel. I think you've all done an outstanding job of summarizing what went on.

I am impressed, and I would just like to give a few of my impressions of what's happened here in the last two days. I think we don't want to forget that some of the speakers told us that it was going to be a hard road to hoe, and I think that has to be remembered, that we have a product that is not going to be easy to sell; but I was encouraged because I feel a lot of the speakers also told us that there is hope that we can sell it, but we have to be extremely clever in the way that we go about finding ways to do this.

I was also impressed through this conference with our state government's response to this activity. I think it was a good showing that in Illinois there is now a thrust that's moving forward, and we're bringing coal to the level or to a focus that it should have had for a long time. I'm encouraged by that, and I'm going to keep after our state agency and our Governor and our Lieutenant Governor to keep pushing in the area of coal because I think it's important to us in this state.

I also agree with what you said, Mel, that I think the industry is in transition; and I think that we're in an industry that has a long way to go in making the transition. I feel that our industry, our coal industry, has been willing not to worry about the material that was dug out of the ground. The attitude has been just to get it out and put it into a truck or a coal car and forget about it. I think that the industry is changing in that attitude, and I think it has to be that way. I think it has to be more concerned about the product and try to make that product fit different kinds of markets.

I feel that Senator Percy's interest in this activity and stimulus for this activity is indeed encouraging; and I think the position that he holds now in the federal government is something that we have to use to our advantage, and I hope that we'll continue to do that. He now has a position that can help us, especially on this particular topic, and I think we don't want to forget that.

I'd be remiss if I didn't say something about research. I think we have to continue to think about the long-range picture. I think we have to begin spending some dollars in that area, worrying about many of the technological problems. I think mining is an area that the industry has to change its attitudes about. Industry's attitude is that we don't need to change anything because we've got capacity for the next 20 years. I think that that attitude has to be changed because those 20 years are going to come up very fast; and unless we start thinking about different ways to get coal out of the ground, we're going to be way behind the eight ball. We're already pretty far behind the eight ball right now, as far as the rest of the world is concerned.

I would like, though, to end on an upbeat note. In addition to Freeman Coal's contract with Spain, there is one other sale that I learned about--and maybe there are others that I don't know about--but I learned that Amax has just sold some coal to Japan on a test basis; and so not only do we have coal going to Europe, but also to Asia as well.

I think that what I said last night at the banquet is accurate, that this conference was a "happening." I truly believe that. I think it was a different kind of a conference than I've attended in

a long time, and I do think that linkages have indeed been built, and I think that we're going to see some very good things happen as a result.

I want to thank all of you for attending and staying with us until the end.

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Dr. Subhash B. Bhagwat is a mineral economist who is presently serving as Head of the Mineral Economics Section of the Illinois State Geological Survey. He has a wide variety of mining-related experiences in the U.S. and abroad, including 18 months as a miner in West Germany. Dr. Bhagwat holds a Ph.D. in mining engineering from the Technical University, West Berlin.

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The Honorable Kenneth V. Buzbee has represented Illinois' 58th District in the State Senate since his election in 1972. He has been Chairman of the Senate Appropriations II Committee and Chairman of the Illinois Energy Resources Commission. In addition, Senator Buzbee has served nationally as a member of

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John W. Castle, Director since 1979 of the Illinois Department of Commerce and Community Affairs, was previously Director of the Illinois Department of Local Governmental Affairs and is a former Director of the Illinois Department of Business and Economic Development. Mr Castle is a 1960 graduate of the University of Chicago Law School.

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Hugh W. Evans, President of the Chicago-based Old Ben Coal Company, has thirty years experience in the minerals industry and has served several firms in various capacities, among them exploration, planning and development, marketing, and mine management. A graduate mining engineer from the Colorado School of Mines, Mr. Evans has traveled extensively internationally in pursuit of his duties.

Wayne T. Ewing is President of the Illinois Division of the Peabody Coal Company. Beginning as a laborer in 1963, Mr. Ewing progressed through various positions at Peabody (including three vice-presidencies) and was most recently President of the Company's Indiana Division. Mr. Ewing has an M.A. in Education from Western Kentucky University.

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C. Kent Garner is Vice-President and Head of the U. S. Section of Continental Illinois National Bank's Mining Division, a firm he has been associated with since 1973. He has worked with midwestern and Appalachian coal mining companies, managed Continental's Corporate Development Division and served in the bank's Sydney, Australia, office as its representative for energy and mineral resources. Mr. Garner has an MBA from the University of California, Berkeley.

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Dr. James P. Hartnett has since 1974 been Director of the Energy Resources Center at the University of Illinois at Chicago Circle. He was previously Professor and Head of the Energy Engineering Department at Chicago Circle and prior to that was Chairman of the Mechanical Engineering Department at the University of Delaware. Dr. Hartnett received his Ph.D. from the University of California, Berkeley, in 1954.

Dr. Michael O. Holowaty is presently Senior Advisor, Research Department, at the Inland Steel Company of East Chicago. He has held various professional and managerial positions in that Department and recently received the 1980 Joseph Becker Award for his work on the development of Illinois coal for metallurgical applications. Dr. Holowaty received his Ph.D. in inorganic chemistry from the University of Breslau, Germany, in 1944.

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Robert Jackson, Manager of the Commercial Division of the Conoco Coal Development Company, is a member of the International Symposium on Alcohol Fuel Technology. He has been involved with the development of alcohol fuels during the past nine years and prior to that worked in the R & D department of Shell Research Ltd. Mr. Jackson is a graduate of the University of Liverpool.

Clarence W. Klassen served from 1935 to 1970 as Illinois' Chief Sanitary Engineer and was the first Director of the Illinois EPA. Since leaving state government in 1971, he has been a self-employed environmental consultant to a number of industrial corporations, utilities, legal firms, and others. He holds a degree in civil engineering from the University of Michigan.

Dr. Bernard S. Lee, President of the Institute of Gas Technology since 1978, is responsible for all IGT operations. Previous to his present position, he served as IGT's Executive Vice-President and also as Vice-President and Head of the Process Research Division. He holds a doctorate in chemical engineering from the Polytechnic Institute of New York.

Bong Suh Lee is Assistant Minister in the Ministry of Energy and Resources in Seoul, Republic of Korea.

Ray Long, Energy Economist since 1979 for International Energy Agency (IEA) Coal Research, London, is an authority on global energy flows and shipping, and has recently developed a computerized energy model to help forecast energy supplies. He has previously served as a consultant in shipping and energy economics for financial institutions. Mr. Long holds a B.A. in economics and geography from Emmanuel College, Cambridge.

Ramesh Malhotra is Assistant Vice-President for Marketing for Freeman United Coal Mining Company where he oversees and directs the company's coal marketing programs. Prior to assuming this position in 1977, Mr. Malhotra was Director of Market Planning at Freeman, and before that he was Principal Mineral Economist for the Illinois State Geological Survey. Mr. Malhotra has an M.S. in business administration from Michigan Technological University.

William W. Mason is President of Island Creek Coal Sales Company and serves also as President of the Coal Exporters Association. Prior to assuming his firm's presidency in 1978, Mr. Mason served in a variety of positions with Island Creek. He received an engineering degree from Marshall University in 1947.

Dr. Harold M. Mayer is Professor of Geography at the University of Wisconsin-Milwaukee and also Senior Scientist at The Center for Great Lakes Studies. The author of numerous publications in the fields of urban and transportation geography, Dr. Mayer has held a number of academic and governmental appointments and has served as a consultant to private and governmental organizations. He holds a Ph.D. in geography from the University of Chicago.

Arthur F. Nicholson, Commissioner of the Bureau of Energy Production and Utilization in the Kentucky Department of Energy, is responsible for the development of policies and programs to enhance the production and utilization of coal and other forms of energy. A retired Air Force officer with experience in the management of large transportation units, he is the author of numerous marketing and transportation reports and has previously served as a Professor of Aerospace Studies at the University of Kentucky and New York University.

The Honorable Charles H. Percy was elected to the U.S. Senate in 1966 and re-elected in 1972 and 1978. He is Chairman of both the Foreign Relations Committee and the Governmental Affairs Subcommittee on Energy, Nuclear Proliferation, and Government Processes. The Senator's major legislative initiatives and accomplishments have focused on government reform, the economy, the elderly, and energy. He has been a strong advocate of legislation to forge a national energy policy. Senator Percy is a graduate of the University of Chicago with a degree in economics.

Dr. Lyle V. A. Sendlein, Professor of Geology, is Director of the Coal Extraction and Utilization Research Center and is also Director of the Illinois Mining and Mineral Resources Research Institute, both of Southern Illinois University at Carbondale. Before coming to the Research Center in 1977, Dr. Sendlein spent seventeen years at Iowa State University as a Professor of Geology, teaching and conducting research in the area of geological engineering. Dr. Sendlein holds a Ph.D. in geology from Iowa State University.

Paul Simon, U.S. Congressman from the 24th District of Illinois, began his professional career as a journalist before serving in the Illinois House and Senate. He was Lieutenant Governor of the State of Illinois from 1969-1973 and was elected to the U.S. House of Representatives in 1974 and subsequently re-elected. Congressman Simon is the author of five books and holds seven honorary doctorates.

Joseph S. Spivey is President of the Illinois Coal Association.

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